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THIRTEENTH ANNUAL REPORT

OF THE

State Board of Health

OF THE

STATE OF OHIO

FOR THE

Year Ending October 31, 1898.

COLUMBUS, OHIO:
THE WESTBOTE CO., STATE PRINTERS.
1899.

Ohio State Board of Health,
Office of the Secretary,
Columbus, O., June 12, 1899.

To His Excellency, Asa S. Bushnell, Governor of Ohio:

Sir: In accordance with section 8 of an "Act to create and establish a State Board of Health," the accompanying report is herewith submitted for the year ending October 31, 1898.

Respectfully,

C. O. Probst, M. D.,
Secretary.

294991

MEMBERS OF THE OHIO STATE BOARD OF HEALTH.

Thos. C. Hoover, M. D., Columbus	December, 1898
R. D. Kahle, M. D., President, Lima	December, 1899
Josiah Hartzell, Ph. D., Vice President, Canton	December, 1900
Wm. T. Gemmill, M. D., Forest	December, 1901
Byron Stanton, M. D., Cincinnati	December, 1902
J. C. Crossland, M. D., Zanesville	December, 1903
Wm. T. Miller, M. D., Cleveland	December, 1904
C. O. Probst, M. D., Secretary.	

Frank Warner, M. D., Columbus, appointed to succeed Dr. Hoover, term expires December, 1905.

GENERAL REPORT.

This is the thirteenth annual report of the State Board of Health, and is for the year ended October 31, 1898. The reports of deaths and contagious diseases in cities and villages, the annual reports of local boards of health, the report of the investigation of the Maumee and Sandusky rivers, and a few other matters, for convenience, are considered for the calendar year. The delay in presenting the report was due to the time required in preparing the special report upon the Maumee and Sandusky rivers, which, for economy, it was deemed advisable to include this year in the annual report.

PERSONNEL OF THE BOARD.

The personnel of the Board remains as it was given in the last annual report, Dr. Wm. T. Miller, of Cleveland, whose term of office expired December 13, 1897, having been reappointed to succeed himself.

MEETINGS OF THE BOARD.

Five meetings of the Board were held during the year, in January, two in April, in June and in October. Minutes of the meetings are given on a following page.

The January meeting, as usual, was held in conjunction with representatives of local boards of health, about 350 being present. A full account of this meeting is published as a supplement to this report.

HEALTH OF THE STATE.

The past year, so far as can be judged by reports received, has been one of unusual good health. There was a marked falling off in the number of deaths reported from diarrhœal diseases of infants during the hot months. The usual epidemic diseases, except smallpox, have been less prevalent than ordinary, and of a markedly mild character.

The lack of proper vital statistics, to the great need of which attention has been repeatedly called in these reports, allows, however, of no accurate statements being made. It was the fervent hope of the Board that the last General Assembly would enact a law providing for the proper collection and registration of vital statistics. A bill was introduced in the Senate by the Hon. H. W. Wolcott, of Cuyahoga county, and passed that branch of the Legislature. It died in the hands of the committee of the House of Representatives, to which it was referred.

While this measure was, perhaps, defective in some particulars, it was a marked advance over present laws. This bill was as follows:

A BILL TO AMEND SECTIONS 6395, 6396 AND 6397 OF THE REVISED STATUTES OF OHIO.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That sections 6395, 6396, 6397 and 6398 of the Revised Statutes of Ohio be so amended and section 6395 be supplemented by the addition of supplemental section 6396*a* so as to read as follows:

Sec. 6395. The probate judge shall keep a record of the births and deaths reported to him, as hereinafter provided; the births shall be numbered, recorded and alphabetically indexed in the order in which they are received, and the record shall state, in separate columns, the date of making the record, the date and place of birth, the name (if it has any), sex and color of the child, the maiden name of the mother, and the name and occupation of the father of the child, and the residence and birthplaces of the parents, as fully as the same are reported; the deaths shall be likewise numbered, recorded and indexed, and the record thereof shall state in separate columns, so far as the same is reported, the date and place of death, name and surname of the deceased, condition (whether single, married or widowed), age, place of birth, occupation, names and birthplaces of parents, * * cause of death, color, and last place of residence of such deceased person, and the date of making the record; and the probate judge for making such records shall receive the sum of five cents for each name fully recorded, to be paid out of the county treasury on his certificate and the certificate and warrant of the county auditor.

Sec. 6396*a*. In counties containing cities having a population of one hundred and fifty thousand and over, when the full report of a birth is filed with the probate judge, it shall be numbered and the record thereof shall be printed. Such record shall be compiled in such manner as to embrace all the items of information contained in the report; the proofs shall be read and corrected under the direction of the probate judge or his clerk. The type used in printing said record shall not be smaller than eight point. Each volume shall contain not more than five thousand reports, and an alphabetical index referring to the number of the report. The reports of deaths shall be numbered, compiled and printed in the same manner as the reports of births. There shall be ten copies of each volume printed; two volumes of each shall be printed in forms of sixteen pages, one copy of which shall be forthwith delivered to the local board of health, and the other to the probate judge for temporary use in his office. The remaining eight volumes shall be bound in full law binding and distributed as follows: Two copies shall be retained for public use in the office of the probate judge, one copy shall be sent to the state board of health, one copy delivered to the local board of health, and the other copies to such local historical, genealogical or medical societies, or public institutions as the probate judge may decide. The printing, binding, registers and blanks necessary to comply with the provisions of this and the preceding supplemental section, shall be paid for out of the county treasury in the same manner as other county supplies.

Sec. 6396. It shall be the duty of the assessors of the several townships and wards of each county of this state, to obtain, annually, * * * at the time each assessor shall make the assessment of his respective township or ward for the year ending the last of March, preceding each annual assessment, the following information concerning each birth occurring in his respective township or ward, and report the same to the probate judge of his county, at the time of his regular report to the county auditor, to-wit: the color, sex, and full name of the child (if it has any), the date of its birth, the name, age, color, birthplace, occupation and residence of the father, and the maiden name, age, color, and birthplace of the mother, and the name and address of the physician, midwife, or other person in attendance at such birth; and at the time of submitting his report to the probate judge, he shall state upon oath that he has made a diligent inquiry in order to obtain a full and complete report of all births * * * in his township or ward, respectively; and for each birth fully reported to the probate judge the assessor shall be entitled to receive the sum of five cents, to be paid out of the county treasury on the certificate of the probate judge and the warrant of the county auditor; and if any assessor in this state shall fail or refuse to make such report, or to make and file the affidavit required by this title the auditor of his county shall withhold his order until the law has been complied with, to the satisfaction of the probate judge. And physicians who have held an autopsy on the body of a deceased person, or attended a deceased person in his or her last illness, and undertakers and sextons who have buried or cremated deceased persons, shall keep a registry of the name, age, residence, and date and cause of death of such persons; and no undertaker, sexton or other person shall bury or cremate in any city, village, hamlet or township, or remove therefrom the body of a deceased person until he has received a permit so to do from the clerk of the board of health or its duly appointed agent, or, if there is no board of health, from the clerk of such city, village, hamlet or township; no such permit shall be issued until there has been delivered to such board, agent, or clerk, as the case may be, a satisfactory written statement containing the name of the deceased, the date and place of death, sex, color, whether married, single or widowed, age in years, months and days, nationality, religion, name and nationality of father, and mother's maiden name and nationality, and place of intended burial; appended to such statement shall be a certificate signed by the attending physician giving the name of the deceased, and the cause and date of death; provided, that if for good and sufficient reason shown this certificate of the physician can not be obtained at the time the application for the permit is made, the same must be filed by the person who made the application with the proper officer within ten days after such permit is issued. In cases where the identity of a deceased person is unknown the person applying for a burial permit shall file with such application a report by the coroner or other person having charge of the body, containing a pertinent description of the deceased stating the sex, color, apparent age, color of hair and eyes, height, and any peculiar features or marks on the body which would in any manner aid in the identification of such deceased person, together with the name and address of the coroner or other person making such report. A physician who has attended a person during his last illness shall, when requested, forthwith furnish for registration, a certificate stating, to the best of his knowledge and belief, the name of the deceased, the cause and date of his death, and his own name and address. It shall be the duty of the clerk or agent of the board of health, or the clerk of the city, village, hamlet or township where there is no board of health, to issue the burial permits as herein provided; and on or before the fifth day of each month to file with the probate judge of his county all applications for burial permits, containing the information herein provided, received by him during the preceding month. No sexton, superintendent or other person in charge of a cemetery, burial grounds or crematory, shall receive for burial or cremation the body of any person without the burial permit hereinbefore mentioned. And any person who shall neglect or refuse to comply with, or violates any of the provisions of this chapter, or who knowingly makes a false return of any fact required to be reported, shall be guilty of a misdemeanor and shall be fined not more than one hundred dollars nor less than five dollars, or be imprisoned not more than ten days nor less than one day, and all fines recovered shall be paid over to the sanitary fund for the use of the board of health within whose jurisdiction such violation occurred.

Sec. 6397. It shall be the duty of the probate judge to furnish to the boards of health of his county, or to the clerk of any city, village, hamlet or township having no board of health, and to physicians, midwives or other persons herein required to make reports, a sufficient number of properly ruled blanks in accordance with forms prescribed by the state board of health for making the reports required by the preceding section, which blanks shall be paid for out of the county treasury.

SECTION 2. That said original sections 6395, 6396 and 6397 be and the same are hereby repealed, and this act shall take effect and be in force on and after its passage.

How much longer is Ohio to continue her present slovenly and practically worthless system of collecting vital statistics?

An intelligent Frenchman, who adopted this country as his own more than 30 years ago, exhibited recently an official certificate of his birth, which he had brought from his mother country. How many persons in Ohio would be able to find an official record of their birth ?

It is to be hoped that the next General Assembly will recognize the wisdom and utility of, and provide the means for making, a complete and accurate record of each birth and death occurring in our State.

SMALLPOX.

Smallpox has made its appearance at many places in Ohio and threatens to become epidemic. The disease has been of an exceedingly mild character, fortunately for the individuals afflicted, but not for the general public, as it is for this reason mainly that it has been impossible to suppress it.

The first outbreak was early in April, at Carroll, Fairfield county. A man of that place, shortly after returning from a trip South, was taken ill and died in a few days from what was pronounced "black measles." Shortly after his wife and children developed an eruptive disease which was called chicken-pox. In these cases, although in unvaccinated persons, the disease was exceedingly mild, the patients scarcely being confined to bed. It was this fact that threw the attending physician off his guard. Two well marked and moderately severe cases of smallpox developed in adults exposed to this family, which left no doubt as to diagnosis. Proper measures were instituted by this Board, and the disease was quickly suppressed, with 12 cases and one death.

In April and May smallpox was introduced into a number of places in Western and Southwestern Ohio by a traveling show—"Uncle Tom's Cabin Show." The facts in the case were not learned until in September. Three members of this show were attacked with smallpox, two of the cases being of a very mild type. In each case the disease was pronounced chicken-pox. No blame whatever can be attached to the proprietor of the show.

The show remained at Loveland until May 14, and one of the company, an adult, was so seriously ill that he was taken from a traveling car to a hotel in that place. Up to the time of reaching Loveland the show was given in opera houses and public halls, but after leaving Loveland performances were given in a tent.

It is worthy of note that no case of smallpox was traceable to this show after it left Loveland, though no measures were taken to disinfect the clothing of the employes or the baggage of the company.

The first case in Delphos was a boy taken ill 14 days after this show was there. He attended the show and was present when the show car was unloaded.

From Delphos the disease spread to Van Wert, a town nearby. In both places the disease masked for a time under the name of chicken-pox. The local authorities, with the assistance of the State Board of Health, quickly suppressed the disease, there having been 34 cases reported in the two places. There were no deaths.

The "Uncle Tom's Cabin Show" gave an exhibition in Wapakoneta April 26. On May 7, Frank Shaffer, who was exposed at this show, was taken ill. The history of this case shows it to have been a fairly well marked case of smallpox, but it was not recognized as such. The disease spread rather slowly from this case, the attacks as a rule being very mild. The disease attacked adults and children, but vaccinated persons almost invariably escaped. A pronounced case occurred in May, which occasioned a consultation of physicians and a conference with the local health authorities, but it was decided to be not smallpox. No efforts were made to check the spread of the disease. The physicians, generally, called it chicken-pox. The laity, or many of them, called it "elephant's itch." The disease gradually spread to the rural districts and villages surrounding Wapakoneta. Finally a case of smallpox developed at Dayton, September 20. This case was directly traced to Wapakoneta, and it was not until then that the attention of the State Board of Health was called to the conditions in that place.

The Secretary of this Board was called to Wapakoneta by the mayor to determine the character of the disease prevailing there. On the same day Dr. James T. Whittaker, of Cincinnati, was called there by a citizen's committee for the same purpose. Each of these physicians, independently, examined a number of cases and pronounced the disease smallpox. The verdict was most distasteful to both the local physicians and to the citizen's committee. The latter fearing commercial hurt, called a "professor of skin and *venireal* diseases," as he signed himself, from Chicago, who made affidavit that there were no cases of smallpox in the place, though there were cases of *varioloid* and some skin diseases with "*puss*" complications. This opinion seemed to be equally unacceptable.

At this time more than 100 cases of smallpox had developed in Wapakoneta and vicinity. Infection lurked everywhere. Many of the physicians still maintained that the disease was only chicken-pox. It was indeed difficult to conceive that smallpox could prevail for five months in a community of 6,000 people, and, without preventive measures, attack so few people; or that smallpox could be so mild in unvaccinated people, that many of them never took to their beds or missed a meal. As one old practitioner, who had had smallpox experience stated it, "If this is smallpox we must rewrite all our text books on the subject." But, when asked how about chicken-pox, he was obliged to admit that this would be equally true if the prevailing disease was chicken-pox.

One may comprehend the difficulty of enforcing proper measures of prevention under such circumstances. Fortunately Wapakoneta had as its mayor at this time, Mr. John G. Heinrich, a man of a determined character and excellent judgment. The following regulations for the prevention of smallpox in Wapakoneta were given to the mayor, and he was told that if he would agree to strictly enforce them a general quarantine against the city would not be permitted:

WAPAKONETA, OHIO, October 4, 1898.

To the Board of Health, Wapakoneta, Ohio:

You are hereby notified that the prompt and strict enforcement of the following measures for the prevention of smallpox will be required by the State Board of Health:

1. The city is to be divided into districts, not too large, and physicians appointed to carry out an order of your board for general vaccination. Free vaccination should be provided for the poor. Physicians should make a house to house canvass of the district, taking a list of the inmates of each house, and report daily to the board of health the persons vaccinated by them and those refusing vaccination, if any, giving names and residences of the two classes. Persons successfully vaccinated within the last year, as determined by the physicians appointed for vaccinating by the board, may be exempted. All persons failing or refusing to be vaccinated shall be quarantined in their homes for two weeks.

2. All schools and churches are to be closed, and all public gatherings prohibited for two weeks from this time.

3. All houses containing cases of smallpox shall be quarantined, and under guard night and day, and no person shall be permitted to leave or enter such house, excepting the attending physician or nurses appointed by the board of health.

4. All persons who have had smallpox during the recent epidemic in this city, and who have recovered, shall be required to go to their respective homes, and to remain there until their clothing, their dwellings and contents shall have been satisfactorily disinfected. All houses in which smallpox has occurred, or shall hereafter occur, shall be disinfected under the direct supervision of the board of health.

5. No mail matter nor money shall be taken from any house while quarantined for smallpox, the money to be disinfected after quarantine is removed.

6. Steps shall be taken at once, in advance of enforcing the order for general vaccination, to have vaccinated all unvaccinated persons in houses where cases of smallpox now exist.

7. It shall be understood, in enforcing these regulations, that all cases of the prevailing eruptive disease, shall be considered and treated as cases of smallpox.

These requirements were most fully and satisfactorily fulfilled, with the result that the epidemic was at once cut short. A record was obtained of 181 cases of smallpox that occurred from this outbreak in Wapakoneta and vicinity. There were doubtless other cases, not reported. Of this number 75 were adults and 106 children. Only 16 of the number had ever been vaccinated, and in 10 of these it had been 15 years or more prior to their attack of smallpox. One hundred and sixteen of the patients gave a history of having had chicken-pox previous to this epidemic.

These figures alone establish beyond question that the disease was smallpox.

One would have supposed that the epidemic at Wapakoneta would have taught other communities a lesson, but it is hard to accept new ideas; and the picture of smallpox carried in the minds of most physicians and the laity is very different from that just painted of the disease as it occurred in Wapakoneta.

A case of smallpox reported at Centre, near Dayton, with the origin ascribed to Loveland, led to an investigation by this Board of the conditions at the latter place. The history of the Wapakoneta outbreak was repeated. The first case of the disease was again traced to the "Uncle Tom's Cabin Show," but in this instance it was mostly those of "Uncle Tom's" color who were affected. Some of the local physicians refused to accept, or doubted the diagnosis of smallpox; and this, in spite of the fact that an adult died of the confluent form of the disease, and a child, prematurely born, showed unmistakable evidence of having gone through with the disease in *utero*. It required repeated visits and continued watchfulness on the part of this Board to secure the enforcement of proper preventive measures.

At Goshen, Clermont county, smallpox was introduced by a woman who contracted the disease while attending "Uncle Tom's Cabin Show" in Loveland, May 14. The mild character of the disease mislead the physicians, and it was not until July 26, when the State Board made an investigation, that the disease was called smallpox, although one or two of the local physicians had previously made this diagnosis.

Smallpox made its appearance at New Carlisle and vicinity May 10, traceable to this same show. It was not recognized as such till some time later, when the State Board was called there. The local physicians, with few exceptions, refused to credit this diagnosis, and the health authorities were at some pains to enforce proper measures. A few severe cases of smallpox, with one death in the neighborhood, finally convinced all unprejudiced persons that the diagnosis of smallpox was correct.

A case of smallpox reported in Hamilton led to an investigation, which showed that the disease had been introduced there many weeks before by a child from Marysville, taken sick the day it came to Hamilton. A number of mild cases developed from this introduction, which were called chicken-pox.

The Hamilton cases led to an investigation of conditions at Marysville. Smallpox had made its appearance there May 13, the three first cases being persons intimately exposed to the disease by "Uncle Tom's Cabin Show." The disease spread slowly. The health officer suspicioned smallpox, but a council of physicians decided it was "impetigo contagioso." No quarantine measures were enforced, except in the case of one family, in which cases were found at the time of the investigation by the State Board.

Smallpox appeared at Wyoming, and was at first mistaken for chicken-pox, but was finally taken hold of by the health authorities, and quickly stamped out.

The disease was introduced in Sandusky in September, the origin of the first case being unknown. A new infection of that place was caused by a woman who contracted the disease in Wapakoneta.

An outbreak of smallpox, having apparently no connection with other cases in Ohio, occurred in August at the Hotel Victory, Put-in-Bay, confined almost entirely to servants of the hotel. Here again the disease was for some time mistaken for chicken-pox. The hotel was closed, rigid quarantine measures were enforced, and the disease was confined to the place of outbreak. The servants' quarters, in which all cases occurred, were burned. The hotel proper remained free from infection.

Smallpox has appeared in Cincinnati and in Cleveland. It is impossible at this time, October 31, 1898, to report fully upon the epidemic. The disease has become so widespread, its character is so mild, giving rise to mistakes in diagnosis, that there is every reason to fear a general epidemic.

The State Board of Health has been active in its efforts to suppress the disease. All local health authorities have been notified of the danger and have been warned to be on the lookout for suspicious cases, and especially suspicious cases of *chicken-pox.* General vaccination has been urged through all possible channels. With but few exceptions each community in which smallpox has appeared, has been visited by the Secretary of this Board, or one of its members, and every possible assistance given to the local authorities in preventing the disease.

At a special meeting of the Board the following rules and regulations for the prevention of smallpox were adopted, copies being furnished to all health authorities and to the press:

RULES AND REGULATIONS OF THE OHIO STATE BOARD OF HEALTH FOR THE PREVENTION OF SMALLPOX.

I. Physicians called to attend persons suffering from smallpox, varioloid (modified smallpox), or chicken-pox, shall report the fact within 12 hours to the board of health within whose jurisdiction such persons are found, giving their names and addresses.

II. When there is good reason to suspect the existence of smallpox in any house or place from a report other than from a physician, it shall be the duty of the board of health to at once make an investigation, by sending a physician to examine and report upon suspected cases.

III. In the case of smallpox or varioloid it shall be the duty of the board of health receiving such report to at once placard the house in which the patient resides or is found, announcing in large letters the existence of Smallpox Within, which placard shall not be removed until after recovery of the patient and disinfection of the house; or the board may remove the patient to an infectious disease hospital, disinfect the house and contents, and quarantine the inmates who are not protected against smallpox by a previous attack of the disease, or by recent successful vaccination, for 16 days from the completion of such disinfection.

IV. In the case of chicken-pox it shall be the duty of the board of health to at once placard the house in which the patient resides or is found, announcing in large letters the existence of Contagious Disease Within, which placard shall not be removed until after the recovery of the patient.

V. A quarantine notice shall be served upon the head of the household forbidding any one to enter or leave the premises except the attending physician or other person authorized by the board of health.

VI. It shall be the duty of the local board of health to strictly enforce this order, which shall be done by placing a day and night guard over quarantined houses whenever necessary.

VII. All persons unprotected against smallpox by a former attack of the disease, or by recent successful vaccination, known to have been exposed to a person suffering from smallpox in the eruptive stage of the disease, shall be quarantined for 16 days from time of last exposure, and be vaccinated.

VIII. Quarantine of smallpox patients shall be maintained until they have completely desquamated or scaled off, as certified by a reputable physician, and until the house and its contents have been properly disinfected under the supervision of the board of health. Persons in the house with the patient who are not protected against smallpox by a recent successful vaccination or a former attack of the disease, shall be quarantined for 16 days from the time disinfection of the house is completed.

IX. Persons who have recently recovered from smallpox, or suspected smallpox, the nature of their malady not having been known or recognized at the time of their illness, shall be returned to their homes until their dwellings and contents, including the clothing of all the inmates, are properly disinfected under the supervision of the board of health.

X. No child in a community in which smallpox actually exists, shall be permitted to attend any public, parochial or private school without presenting satisfactory evidence of having been successfully vaccinated.

XI. It shall be the duty of the local board of health or its health officer receiving a report of a case of smallpox within the jurisdiction of such board, to at once report the case, by telegram when possible, to the State Board of Health.

XII. The Secretary of the State Board of Health, as its Executive Officer, is hereby authorized and directed to secure the strict enforcement of the above rules and regulations, with such modifications thereof and such additions thereto as the exigencies of any particular case may demand.

(Adopted November 29, 1898.)

Many other states have been afflicted with smallpox during the present year. This is especially true of Kentucky, Florida, Virginia, Alabama, Mississippi, South Carolina, Tennessee and Nebraska. The disease in all places has manifested the same mild character it has shown in Ohio, the mortality, as nearly as can now be arrived at, being only about one per cent.

INVESTIGATION OF RIVERS.

The investigation of the streams of Ohio, begun by the Board in 1897, has been continued during the present year. The Maumee and Sandusky rivers were selected for the investigations of this year. The results of the work are given in detail in another part of this report.

A study of these results will show that the Sandusky river has already become, at places, polluted to such a degree as to be a serious danger to the public health. In summer this stream, especially in its upper reaches, diminishes to an extent that no longer enables it to receive the sewage of the cities upon its banks without the creation of a serious nuisance. The conditions at Bucyrus are especially bad, and should compel that city in the near future to make some provisions for purifying its sewage. The use of the waters of the Sandusky river for domestic purposes is attended with considerable danger, presenting a problem of much seriousness to the cities depending upon it for a public water supply.

Related to this investigation of streams is a special report upon the condition of public water works in Ohio, given on a later page. Every city and village having a public water supply, in whole or in part of surface origin, has been investigated by an engineer appointed for that work. His report will be used as a basis for further investigation of the pollution of these water supplies.

NEW SYSTEMS OF WATER SUPPLY AND SEWERAGE.

The Board has been called upon to approve plans for the introduction of new water supplies in the following places: Cincinnati, Caldwell, Columbus, Dennison, Wellington, Bloomville, Salem, Wooster, Sycamore, Mt. Gilead, Lakeside, Chicago Junction, Mingo Junction and Mineral Point. A full report of the character and sources of the various supplies proposed for these places will be found on subsequent pages.

The proposition of the city of Columbus is deserving of special consideration. It was proposed to extend the present system of filter galleries as a means of tiding over for a time the shortage of water, and to avoid the use of water from the Scioto river. In addition to this is the main proposition, a storage dam in the Scioto river, to be constructed. The Board's studies of the character of water in this stream show that it will not be a safe water supply without adequate purification. The amount and character of suspended matters in the water, at times, may make this a somewhat difficult matter to accomplish. The plans for the dam were approved, but with a proviso that water from the river should not be used unless purified in a manner satisfactory to the Board.

The plans for improving the water supply of Cincinnati were approved upon the same condition. This city, however, has wisely decided in advance to purify its water supply, to be taken from the Ohio river, before delivering it to consumers, and has established an experimental filter plant to determine how this can best be done. The results of the experimental work at Cincinnati will be of assistance to other Ohio cities in reaching a solution of this very important problem.

Ironton, also taking a water supply from the Ohio river, is discussing the question of water filtration.

The pollution of Ohio river water supplies is a serious question of increasing gravity. Thirteen Ohio cities, with an aggregate estimated population (1900) of 527,860, take water from the Ohio river. The estimated urban population contributing sewage to the river including Cincinnati, the last city in Ohio upon its banks, is 2,176,963. Many of these cities are close together, so that the sewage of one, with a flow in some cases of but 10 to 12 miles, finds its way into the water works intake of the city next below. Some of these cities are sewered, others are demanding sewerage. Shall Ohio forbid the turning of sewage into this river while other states permit it to be done? This is the serious question that the Ohio State Board of Health has already been called upon to decide. There is scarcely a doubt that this river is now polluted to a degree that renders unsafe any public water supply taken from it unless purified in some manner. This pollution must inevitably increase, and Ohio cities making use of this river should lose no time in providing means for rendering its waters safe.

Plans for new sewerage systems or extensions of old ones have been brought before the Board by the following places: Toledo, Napoleon, Ripley, Lebanon, Winton Place. Plans for sewage purification works have been approved for Glenville, East Cleveland, Clyde, Massillon Hospital for Insane, and a part, one cottage, of the Hospital for Epileptics at Gallipolis.

There is cause to fear that some of these plants in Ohio will not be wholly satisfactory in operation. Communities and individuals before viewing sewage purification plants in operation, are apt to be incredulous as to the powers of filter beds and irrigation fields to purify sewage. Committees, to whom the question of introducing works for a town or institution is referred, after a somewhat superficial study of the subject, are too often led to the other extreme and conclude that it is an exceedingly simple problem. Crude ideas, carried into execution in work of this kind are apt to be disastrous. The soil may be unsuitable, the area too limited, the underdrains improperly laid or the sewage improperly distributed. Furthermore, the designing engineer seldom superintends the construction of the work—the carrying out of his ideas. Others fail to see the necessity of following the plans closely, or introduce changes and improvements (?). It cannot be too strongly impressed upon cities seeking relief from unsanitary conditions by the introduction of sewage purification works, that sewage purification is a complex problem, different, in detail, for each place, and which can only be satisfactorily solved by a thorough study of local conditions. From what is here said it should not be thought that sewage purification is still in the experimental stage. It has long ago passed this; and it is possible for any city to successfully purify its sewage, and at a reasonable cost. But, for any particular place we should have the system best adapted to the local conditions, constructed in accordance with the plans, and operated with an intelligence that will secure the best results.

Ohio has made considerable progress in the matter of building sewage purification works within the last few years, but only the most watchful care will keep these up to a proper standard of efficiency.

LOCAL BOARDS OF HEALTH.

An abstract of annual reports from local boards of health may be found on a subsequent page. This will show that many of these boards have been actively at work during the year. It will be seen, however, that the amount spent for keeping up boards of health is very small—nothing at all in many places.

Sanitation has always been largely a labor of love, but why should it be? The individual in the community is unable to protect himself against many causes of disease and death. Should he not be willing to pay some one to do this for him? The laborer is worthy of his hire, and the health officer should receive an adequate compensation for his services to the public. While the work of the health officer is often far from what it should be, it is much beyond the reward he receives from it

SECRETARY'S REPORT AND MINUTES OF BOARD MEETINGS.

JANUARY MEETING.

A regular meeting of the State Board of Health was held at the office of the Secretary, in Columbus, January 19, 1898.

Present: Drs. Hoover, Stanton, Kahle, Crossland and Mr. Hartzell.

The Board was called to order at 8 P. M., by Dr. Hoover, President.

The minutes of the last meeting were read and approved.

The Secretary presented his quarterly report. On motion of Dr. Stanton, it was received and ordered filed.

A communication from the attorney general relative to abating a nuisance at Hyde Park, was read.

On motion of Mr. Hartzell, the Secretary was instructed to call the attention of the health officer of Cincinnati to section 2433, relating to the protection of public water supplies.

Mr. Davis, president, and Mr. Kurtz, a member of the board of health of Athens, asked permission to lay before the Board certain amendments to the health laws, which they contemplated presenting to the Legislature. On motion of Mr. Hartzell, they were requested to formulate their proposed amendments and refer them to the President and Secretary of the Board for further action.

They also made complaint to the Board of the pollution of the Hocking river by sewage from the Athens Hospital for Insane. They were assured of every assistance possible for the Board to give them in securing the abatement of this nuisance.

Prof. N. W. Lord presented a report of his chemical examinations of the Scioto, Olentangy and Mahoning rivers.

The Secretary presented correspondence with Mr. F. H. Newell, of the U. S. Geological Survey, offering to coöperate with the Board in securing measurements of streams.

Dr. Kahle moved that the Board accept such coöperation. Carried.

The Secretary was instructed to report at the next meeting on the cost of printing the report on Examination of Streams.

Dr. Kahle submitted an amendment to section 6 of the act establishing the State Board of Health, removing the limit to the number of meetings the Board may hold.

On motion of Dr. Crossland, it was voted to submit it to the Legislature.

Dr. Kahle reported on an investigation of an epidemic of diphtheria at Port Clinton. On motion of Dr. Stanton, the report was received and filed.

Mr. Hartzell, having been appointed by the President a committee to wait upon President McKinley, to urge the appointment of an expert commission to study yellow fever, presented a report of the committee's work. On motion of Dr. Stanton, the report was received and filed.

It was then voted to adjourn to 9:30 A. M. of the following day.

SECOND SESSION.

The Board reassembled at 9:30 A. M., January 20, 1898.

Present: Drs. Hoover, Stanton, Kahle, Gemmill and Mr. Hartzell.

Mr. Brown, city engineer, of Toledo, and a member of the city council, appeared before the Board with plans for Sewer Districts Nos. 28, 29 and 30.

Dr. Stanton moved that the authorities of Toledo be requested to furnish the Board a complete map, showing the location of existing sewers, of those which have already been approved by the Board, and of those they now desire to have the Board approve. The motion was seconded and carried.

Plans for improving the public water supply of Cincinnati, previously reported upon by committee, were, upon motion of Mr. Hartzell, approved.

Plans for a public water supply for the village of Caldwell, reported upon by committee, upon motion of Dr. Stanton, were approved.

Plans were presented for disposing of the sewage from the Cottage for Insane at the Epileptic Hospital, Gallipolis. On motion of Dr. Kahle the plans were approved.

Communications and a petition from residents of Lakeside, praying that the Board would permit wells which had been ordered closed to remain open during the winter, were read. Dr. Stanton moved that the time for complying with the order of the Board, closing the wells, be extended to May 1, 1898. Dr. Kahle moved to amend by permitting only the Bradley and McKenzie wells to remain open until May 1.

The amendment was put to vote and was carried. The motion as amended was then adopted.

The Secretary presented the matter of amending the rules regulating the transportation of dead bodies so as to have them in conformity with the agreement reached by the Conference of State Boards of Health, American Public Health Association, National Association of General Baggage Agents, and the National Association of Funeral Directors.

On motion of Mr. Hartzell, the Secretary was instructed to draw up necessary amendments to the present rules and submit them to the Board.

The Secretary reported that he had been informed that the plans being followed in putting in sewerage and sewage disposal works at Shelby, would permit of crude sewage being discharged into the creek, which was not in accordance with the plans approved by the Board. The Secretary was instructed to inquire into the matter and report.

Communications from Mr. H. F. Dunham, engineer, of New York City, and Mr. H. A. Kelley, attorney, of Cleveland, in reference to securing an act of Legislature granting to water works companies the right of eminent domain, were read. On motion of Dr. Kahle the communications were ordered filed.

The Secretary presented an argument in favor of the Board maintaining its own laboratory for chemical and bacteriological examinations. On motion of Dr. Stanton the matter was referred to the President and Secretary for investigation and report.

The question of the appointment of an expert commission to study yellow fever was discussed, and on motion of Mr. Hartzell it was voted to take no action in the matter until after the introduction of a bill in Congress to create such a commission, the Board to support the measure if it should prove satisfactory.

No further business presenting, the Board adjourned to meet in joint session with the Conference of State and Local Boards of Health.

Attest. C. O. Probst, M. D.,
Secretary.

QUARTERLY REPORT OF THE SECRETARY.

Mr. President: Your Secretary begs leave to report as follows:

November 4, at the request of the board of health of New Straitsville, I visited that village and conferred with the members of the board as to the measures to be taken to abate certain nuisances of which complaint had been made.

November 10, by request of the mayor and council, I went to Blanchester for consultation regarding a proposed public water supply. More than a year ago Blanchester put down a well and erected a pumping station for a public water supply. I examined the well when it was about completed. Its location was not entirely favorable. Branches of trees and other debris near the bottom of the well indicated that it had pierced an ancient swamp. A chemical examination of the water found showed it to be not of good quality. I informed Mr. McKibben, the consulting engineer, of the fact, and be requested that no action be taken until they could look further for a supply. In spite of this, however, pumping works were erected, and the water put in use. This was not known by me until a few months ago. The supply was inadequate, the well furnishing a few thousand gallons only per day.

On my last visit I was shown where it is proposed to locate an impounding reservoir, the source of supply to be a small wet weather stream, with but one house upon the water shed. They wished also to utilize the well. I collected another sample of the well water, which was examined and condemned by the chemist. Notice of this was sent to the council. I also notified them to prepare plans for the new supply they proposed to introduce, and furnish them to the Board for consideration. This has not yet been done.

On November 15, I went to Caldwell with Dr. Crossland to inspect the source of the proposed public water supply for that place. This supply has been reported upon by Dr. Crossland, and has been approved by the Board by a mail vote.

December 3, at the request of the council and a citizen's committee, I attended a public meeting at Bowling Green, and discussed the question of sewerage and sewage disposal. The question of issuing bonds for sewerage works will be submitted to the voters of Bowling Green this spring.

Preparations have been completed for the joint meeting of boards of health, to begin to-morrow. A rate of one and one-third the regular fare has been secured on all railroads.

Striking an average of what was thought necessary by the members of the Board for our next appropriation, and after consulting the President, I made request for $30,000 for two years' work.

The Board has to its credit to-day $2,632.40; balance of former appropriation for the two years ending February 15, 1898.

With the consent of the President, I employed Dr. George W. Wire to catalogue the library. Dr. Wire comes from the Library Bureau of Chicago, with the highest recommendations. He began work December 27, and will probably finish in another week. He is making an index catalogue which will enable one to readily find anything in the library.

I desire to submit the following plea for a laboratory for the State Board of Health:

A PLEA FOR A LABORATORY FOR THE STATE BOARD OF HEALTH.

GENTLEMEN: I scarcely need to call attention to the fact that each year the work of State and municipal boards of health is making greater demands upon the laboratory.

When this Board was established in 1886, there were but few laboratories devoted to public health work, and these were mostly employed for the chemical examination of food, water and air. Since that time the developments in bacteriology as regards the causation, diagnosis and prevention of disease, have made it necessary for health authorities to depend more and more upon bacteriological laboratories.

Most of our large cities, and some 10 or 12 states now have bacteriological laboratories in connection with their health departments. The following is a brief outline of the work that could be done now in a laboratory of that kind in Ohio, as I view it, and the work would undoubtedly grow and broaden from year to year:

First, the diagnosis of diphtheria. We have already done something in this line by outside help, but only in cases of disputed diagnosis. It has frequently happened that the physicians in a place have been in dispute as to whether a prevailing throat trouble was diphtheritic or some other disease. The health authorities in such cases are at a loss to know how to proceed. On appeal to the Board, I have sent culture tubes and telegraphed the results of bacteriological examination. If our local boards of health knew we had a laboratory for such work, the number of calls for assistance of this kind would rapidly increase. It is certainly of the utmost importance to the public that a question of that kind should be settled at the earliest possible time.

A few demands have been made for the bacteriological diagnosis of typhoid fever. This being a later development in bacteriology, and not so firmly established as the diagnosis of diphtheria, fewer calls were to be expected. The Minnesota Board, however, reports having made over 1,000 bacteriological examinations for typhoid fever in their laboratory.

A few calls have been made for the examination of sputum in suspected tuberculosis. As the knowledge of the contagiousness of tuberculosis gains ground among the people, as it surely will, the opportunities for work in this direction will be greatly extended. We have already given considerable attention to the examination of water, although I have refused to examine many suspected wells from lack of funds.

The Board has commenced what will, if completed, prove a work of great value, in its examination of the streams and public water supplies of the State. The chemical and bacteriological work has been well done, but the examinations could have been made at more frequent intervals, and there would have been other advantages, if the Board had had its own laboratory. The Board is called upon to approve new water supplies; the data for approval have not always been as complete, especially in regard to the quality of proposed water, as could have been desired. With an employe of the Board qualified for such examinations, and who could be sent to the place, if necessary, to study the proposed supply on the ground, better judgment could be formed as to the desirability of the proposed supply.

A number of sewage purification works have been or are being built in Ohio. There is reason to believe that this number will be much increased in the near future.

Several plants for the purification of water have also been introduced. It is of much importance that some oversight should be kept of these works, both to determine their efficiency and as a guide for other places seeking information as to best methods for purifying sewage and water. With a laboratory, the Board could have frequent examinations made of the purified sewage and water and be better able to advise local authorities in regard to such matters.

The cost of fitting up and conducting a laboratory will not be great. I would suggest that two rooms be secured in a building near the State House. The laboratory could be gradually furnished, commencing with an equipment sufficient for immediate wants.

The cost of conducting the laboratory could be reduced by charging small fees for some of the work; this is done in some states, I believe, although the advisability of charging fees has been questioned. That special appropriations for special investigations will be given us in the near future, I am firmly of the belief.

With a laboratory, Ohio may keep her Board of Health in the front ranks, where by right it ought to be; but without such aid we cannot hope to keep up with the rapid march of science, as applied to the prevention of sickness and death.

Respectfully submitted,

C. O. PROBST, M. D.,
Secretary.

APRIL MEETING.

A regular meeting of the State Board of Health was held at the office of the Secretary in Columbus, April 20, 1898.

The meeting was called to order by the President, Dr. Hoover, at 7:30 P. M. Present: Drs. Hoover, Miller, Stanton, Kahle, Crossland, Gemmill and Mr. Hartzell.

On motion of Dr. Miller the reading of the minutes was suspended.

Mr. Jacobs, director of public improvements, and Mr. Griggs, city engineer, of Columbus, presented plans for changes in the water supply of the city of Columbus.

Mr. J. F. Forbes presented plans for improving the water supply of Dennison by means of filtration.

Mr. Couch, mayor of Wellington, presented verbally a plan for providing water for the village of Wellington for fire and mechanical purposes only.

The Secretary presented plans for sewering Districts Nos. 28 and 33 in the city of Toledo, as furnished by the city engineer.

On motion of Dr. Kahle it was voted to approve said plans for sewers for Toledo.

The minutes of the last meeting were then read and approved.

The Secretary presented his quarterly report which was accepted.

It was voted to visit the water works station of Columbus and inspect the proposed changes in water supply at 10 A. M. Thursday, April 21, 1898.

On motion of Dr. Miller the request for approval of changes in the water supply of Dennison was referred to a committee for investigation and report.

The Chair appointed as members of this committee Messrs. Miller, Crossland and Hartzell.

Dr. Miller moved that the request for approval of plans for a water supply for Wellington be referred to the Secretary with power to act. Carried.

On motion of Dr. Miller it was voted to appoint a committee to investigate the sanitary condition of Lakeside.

The Chair appointed on this committee Drs. Gemmill and Kahle.

On motion of Dr. Gemmill the Secretary was authorized to employ another clerk.

Bids for printing the report on Investigation of Streams, from the Berlin Printing Company of Columbus, and from J. B. Savage of Cleveland, were read. The bid of Mr. Savage being the lowest it was, on motion of Dr. Miller, voted to award to him the contract for printing the report.

A communication was read from the health officer of Conneaut stating that a child suffering from diphtheria had come there by rail from Ashtabula, on April 16, bearing a letter from a physician of Ashtabula certifying that he had on that day administered antitoxin to the child. It was further stated that the case had not been reported to the board of health of Ashtabula.

The Secretary was instructed to report the matter to the board of health of Ashtabula with the request that the physician who failed to report the case should be prosecuted for violation of section 2118 of the Revised Statutes.

The matter of drafting a question for discussion at the next meeting of the Conference of State and Provincial Boards of Health of North America was referred to the Secretary.

A communication from Dr. Harmon of Lancaster was read and ordered filed.

Adjourned to 9 A. M. of the following day.

SECOND SESSION.

The Board reassembled at 9 A. M. All members were present.

Plans for a public water supply for the village of Bloomville were disapproved.

Plans for sewering District No. 2, of East Liverpool, previously approved by mail vote, were taken up and approved.

Plans for sewerage and sewage disposal for the Hospital for Insane at Massillon were presented.

On motion of Mr. Hartzell the plans were approved.

The committee on revision of rules governing the transportation of dead bodies was continued.

On motion of Dr. Stanton, Dr. Miller was authorized to represent the Board at the next meeting of the British Medical Association.

The Board then went to the pumping station of the Columbus water works and made an examination of proposed changes in the water supply.

THIRD SESSION.

The Board reassembled at 12:30 P. M. Present: Messrs. Hoover, Stanton, Kahle, Gemmill and Miller.

On motion of Dr. Kahle it was voted to appoint the President, Secretary and Mr. Hartzell a committee to investigate and report upon the proposed changes in the water supply of Columbus, said committee to be authorized to employ engineering assistance if deemed necessary.

On motion of Dr. Stanton a recess was taken subject to the call of the President.

Attest. C. O. PROBST, M. D.,
Secretary.

QUARTERLY REPORT OF THE SECRETARY.

MR. PRESIDENT: Your Secretary begs leave to submit the following report:

Messrs. Davis and Kurtz, of Athens, who presented at the last meeting a rough draft of amendments to our health laws, prepared a bill, which was handed to me. It was introduced in the House by Mr. Allen, and I obtained a hearing before the committee to which it was referred. Several features of the bill were quite objectionable to the committee, but amendments were agreed upon, and the bill was recommended for passage. It has not yet reached a vote in the House.

The bill prepared by Dr. Kahle, removing the limit to the number of meetings the Board may hold, met with a number of delays in the House, but finally passed April 6, and was referred to the Judiciary Committee of the Senate. It is now on the calendar for third reading, and will probably reach a vote this week.

The President and I, to whom was referred the question of a laboratory for the Board, deemed it expedient to have the laboratory placed firmly on its feet by an act of Legislature. We prepared a bill, which was introduced in the Senate by Mr. Carpenter. The committee to which it was referred, suggested a number of amendments, among others, increasing the powers of the State Board for the suppression of epidemic diseases. The bill passed the Senate without a dissenting vote. It came up in the House April 13, late in the afternoon, when only 56 members were present. By a misunderstanding it received eight negative votes in the 56, and was defeated. A motion to reconsider it was passed April 18.

The Board has been given $29,000 appropriation for the two years' work.

February 24, I attended a meeting of the boards of health of Crawford county, and presented a paper on "The Powers and Duties of Township Boards of Health." The meeting was well attended, and was a very interesting one.

March 3, I visited East Liverpool and inspected plans and location of sewers for District No. 2. A special report of this has been made to the Board.

March 18, by request of the health officer, I visited Dayton. Council had refused to pay the expenses of the board. A former board of health had created a deficiency of several thousand dollars, and the money appropriated for sanitary purposes was being held to pay this debt. In the evening a joint meeting of committees from the council, tax commission, board of city affairs and board of health was held. It was agreed that the debt of the board of health should be paid, but there was an entire disagreement as to how this should be done. A better understanding was effected, however, and I judge the board will receive a better support.

Smallpox has appeared near the village of Carroll, Fairfield county.

The Secretary of the State Board of Health, having been informed of a suspected case of smallpox at that place, made an investigation and reported as follows:

To the State Board of Health:

Gentlemen: I was summoned to Carroll, Fairfield county, April 6, 1898, to examine a suspected case of smallpox. I was taken to see Hiram Raver, who lives about one-half mile from the village, and found him suffering from a well-marked case of smallpox. The family consisted of Mr. Raver and four small children—none of them protected by vaccination. The latter were at once vaccinated.

The following information bearing on the case was obtained:

Solomon Smith, aged 72 years, living near Carroll, went to Way Cross, Ga., about February 20, 1898. He returned home March 2. He was taken ill March 7, and died March 13, from what the attending physician pronounced measles. Subsequent developments made it certain that it was a case of hemorrhagic smallpox. Fortunately there was a private burial and funeral.

In this family there were Mrs. Smith, a grown son and three small children. The children had never been vaccinated. About March 25, or within a few days of that time, these five persons were taken ill. The cases were pronounced chicken-pox. The mother and older son were but slightly ill, and at no time confined to their beds. They developed but a scanty eruption, which did not fully mature. The children, and especially the youngest one, had a very plentiful eruption, but at no time were any of them seriously ill, taking their meals with regularity.

Hiram Raver, the patient I examined, is a son-in-law of Mr. Smith, and went frequently to see the Smith family during their sickness. He was taken ill March 27.

As the disease had been taken for chicken-pox until the time of my visit, a number of people had been exposed.

A meeting of the township board of health was at once called. Dr. H. A. Brown, who was attending the cases, was appointed township health officer. The Raver and Smith families were quarantined, guards being appointed for day and night duty. As far as possible, persons who had been exposed were found and vaccinated. Two families, whose members had been greatly exposed to the disease, were also quarantined.

The board of health of the village of Carroll, having been defunct for several years, the mayor was requested to call a meeting of council and appoint another board. This was done. General vaccination was urged.

Respectfully,

C. O. Probst, M. D.,
Secretary.

Since writing the above report there have been the following developments: Four children in the family of Mr. Raver have come down with smallpox. Also a domestic in the family of Mr. Dunlap, who had been previously quarantined on account of having been exposed to the disease. No other cases have occurred in Carroll.

In Columbus, a blacksmith named Smith, developed smallpox about April 14. While in Carroll on the 6th I heard of this man having visited the Smith family in Carroll, who were having smallpox. On returning, I notified the health officer of Columbus, and he located the man in the West Side of the city. His family consists of himself and wife. I advised the health officer to vaccinated both of them, and to keep Smith under daily observation for 15 days from the time of his exposure to smallpox, which was on April 3. The man was closely quarantined at the very onset of his attack, which was abrupt, so that there has been no one except his wife exposed.

The following communication was received in reference to changing the plans for sewage disposal at Shelby:

MANSFIELD, OHIO, January 26, 1898.

Dr. C. O. Probst, Secretary State Board of Health, Columbus, Ohio:

HON. SIR: Your favor of the 24th at hand and contents carefully noted. In the first place I want to assure you that nothing will be done in Shelby or elsewhere by me that will be contrary to the wishes of your Board. I am glad for the State Board of Health and am greatly benefited by your work. There seems to be some misapprehension as to our purposes of conduct at Shelby. The outlet sewer is a contingent outlet from Station 7 to the creek and lies at a level of four feet below the line above Station 7, Station 7 being the manhole where the sewage is deflected from the contingent outlet to the different filters. This manhole is provided with gates. The contingent outlet receives the effluent thereon and is passed on to the creek. It is expected to build a levee around the whole filter area to protect from overflow, and we wish to secure the outlet against injury from high water by masonry.

In building the contingent outlet, the thought was also to use it during the winter months for the direct discharge of the sewage into the creek, until such time, after the town had connected with the sewers, that it would not do. I understand this is what Canton, Ohio, does. Now if this is contrary to your wishes and you want the treatment to continue during the winter months we shall comply with your request. The filter will be constructed before the sewers are completed. I will prepare plans and specifications therefor in the spring and forward the same to you for approval.

Awaiting your answer to the above, if not satisfactory, I am,

Very respectfully yours,

J. B. WEDDELL.

To this letter I replied as follows:

COLUMBUS, OHIO, January 28, 1898.

Mr. John B. Weddell, C. E., Mansfield, Ohio:

DEAR SIR: Your letter of the 26th with reference to plans for sewerage of Shelby ust received. The Board did not understand that you were to have a "contingent" sewer outlet. It will be necessary for you to resubmit the plans, or at least that part of them showing the contingent outlet. If you will send me a short description of what you are proposing to do and of how this contingent outlet is to be used, I will have copies made and send them to the members of the Board and ask them to vote on the question by mail. I view with some distrust this contingent outlet; it is much like a contingent *inlet* for a public water supply, to be used only in case of fire, but which is, in many cases, often used at other times. However, I will submit the question to the members of the Board and allow them to decide it.

Yours truly,

C. O. PROBST, M. D.,
Secretary.

ADJOURNED APRIL MEETING.

Pursuant to adjournment the State Board of Health met in Columbus, at the office of the Secretary, on April 27, 1898, and was convened at 7:45 P. M.

All the members were present; Dr. Hoover presided.

The law authorizing the Board to establish a laboratory was read by the Secretary. On motion of Dr. Kahle, it was voted to establish a laboratory in accordance with the provisions of the law.

The Secretary reported that he had found two rooms suitable for a laboratory in the Board of Trade building, which could be rented for $15 a month.

On motion of Dr. Stanton, the Secretary was authorized to rent these rooms for a period of two years, at a rent of $15 per month.

Drs. Hoover and Probst presented a committee report on the uses to be made of the proposed laboratory. On motion of Dr. Stanton, the report was received. After discussion, it was voted, on motion of Dr. Stanton, to adopt the report.

On motion of Dr. Kahle, it was voted to pay the Secretary $500 per annum as director of the laboratory, beginning with May 1, 1898.

On motion of Mr. Hartzell, the Secretary was authorized to employ a bacteriologist at a salary not to exceed $125 per month.

The question of continuing the investigation of rivers was discussed, and, on motion of Dr. Stanton, it was voted to make an investigation of the Maumee and Sandusky rivers, similar in character to the one already completed of the Scioto, Olentangy and Mahoning rivers.

No further business presenting, the Board adjourned to meet in Cleveland on the evening of June 8, 1898.

Respectfully submitted,

C. O. PROBST, M. D.,
Secretary.

OUTLINE OF PLAN FOR THE CONDUCT OF THE BACTERIOLOGICAL LABORATORY OF THE STATE BOARD OF HEALTH.

Your committee to which was referred the question of the use to be made of a laboratory of the Board, respectfully reports as follows:

(*a*) We recommend that two rooms in an office building near the State House be secured for laboratory purposes.

(*b*) That the President and Secretary be authorized to fit up the laboratory at a sum not to exceed $800 unless so authorized by further action of the Board.

(*c*) That an offer be made to all local boards of health and superintendents of State institutions to make bacteriological examinations free of charge in all cases of diphtheria, typhoid fever, tuberculosis, rabies or glanders, where the character of the disease is in dispute. Also, when requested, to make bacteriolgical examinations in cases of diphtheria to determine when quarantine may be safely dismissed.

(*d*) That chemical or bacteriological examinations of samples of water, milk or food, be made free of charge for local boards of health and State institutions where there is sufficient reason to believe that they have been the cause of disease. In all such cases the local authorities should bear all cost of transportation.

(*e*) That in all examinations made for local boards of health or State institutions they be required to furnish such information concerning the patient, or the specimen to be examined, as the Board may deem necessary.

(*f*) That preparations be made at once for the examination in the laboratory of samples of water from such rivers as the Board may determine to have investigated during the present year.

(*g*) That the Secretary be instructed to prepare a circular to be sent to all local boards of health and superintendents of State institutions explaining the conditions under which laboratory examinations will be made, and giving proper instructions for sending specimens for examinations.

(*h*) That all examinations required in the approval of proposed sources of public water supplies be made in the laboratory of the Board.

Respectfully submitted,

C. O. Probst, M. D.,
Thos. C. Hoover, M. D.,
Committee.

Attest. C. O. Probst, M. D.,
Secretary.

JUNE MEETING.

A regular meeting of the State Board of Health was held at the Hollenden Hotel, in Cleveland, Ohio, June 8 and 9, 1898.

All members were present; Dr. Hoover presided.

Messrs. Holden and Pratt, president and engineer respectively of the Cleveland Park Board, appeared before the Board with a request for approval of a sewer in Gordon Park.

Action was deferred until the request could be placed in writing.

Mr. Allison, superintendent of the water works of Salem, presented a request for approval of additional water supplies for that city.

The matter was referred to executive session.

Messrs. Zimmerman and Overholtz, members of council of Wooster, presented a request to continue the use of Apple creek as a supplementary water supply.

The matter was referred to executive session.

Mr. Gill, Mr. McKim and other representatives of the Lakeside Assembly Company, appeared before the Board in reference to carrying out the Board's orders for improving the sanitary condition of Lakeside.

The matter was referred to executive session.

The minutes of two meetings held in April, 1898, were then read and approved.

The Secretary presented reports upon the sources of proposed water supplies for Sycamore and Mt. Gilead.

On motion of Dr. Miller, it was voted to approve the source of proposed water supply for Sycamore.

On motion of Dr. Gemmill, it was voted to disapprove the proposed source of water supply for Mt. Gilead.

The Secretary presented the draft of a circular letter to superintendents of public institutions in reference to the prevention of tuberculosis, and offering to examine suspected tuberculous sputum.

The Secretary presented a table and chart showing sources of public water supplies in Ohio, as prepared by Mr. Flynn, from data taken from the Manual of American Water Works.

On motion of Mr. Hartzell, it was voted to authorize the Secretary to employ Mr. Flynn to collect data for a report upon the condition of public water supplies in Ohio.

Messrs. Hartzell, Hoover and Probst presented a report upon proposed changes in the water supply of Columbus.

On motion of Dr. Crossland, it was voted to approve the report.

The report of Drs. Gemmill and Kahle upon the sanitary condition of Lakeside was considered.

Dr. Stanton moved that the report of the committee be sustained, and that the Lakeside Assembly Company be required to put in operation for their entire water supply some approved system of water filtration. Carried.

It was voted, on motion of Dr. Stanton, not to grant the request of representatives of the council of Wooster to continue the use of water from Apple creek.

On motion of Dr. Kahle, the request for approval of an additional water supply for Salem was referred to Dr. Stanton and Mr. Hartzell for investigation and report.

The election of officers was taken up.

Dr. R. D. Kahle was nominated for President. The Secretary was instructed to cast the ballot of the Board for Dr. Kahle as President, which he did.

Mr. Hartzell was nominated for Vice President. The Secretary was instructed to cast the ballot of the Board for Mr. Hartzell as Vice President, which he did.

Adjourned to 8:30 A. M. the following day.

SECOND SESSION.

The Board met pursuant to adjournment.

Present: Drs. Hoover, Kahle, Hartzell and Stanton.

Dr. Stanton moved that the outlet of the sewer proposed for Gordon Park be approved, provided a written statement corresponding to the verbal report made to the Board by the engineer of the park board be first filed with the State Board of Health. Carried.

On motion of Dr. Stanton, the President-elect and the Secretary were delegated to represent the Board at the next meeting of the American Public Health Association.

On motion of Dr. Hoover, it was voted to appoint each member of the Board a delegate to the next meeting of the Conference of State and Provincial Boards of Health of North America, to be held in Detroit.

On motion of Dr. Kahle, a recess was taken to the call of the President.

Attest. C. O. Probst, M. D.,
Secretary.

QUARTERLY REPORT OF THE SECRETARY.

Mr. President: Your Secretary respectfully reports as follows: Pursuant to instructions I have leased two rooms in the Board of Trade building for a laboratory, for a period of two years, at a rental of $15 a month. I have engaged Mr. Elmer G. Horton, of Philadelphia, as bacteriologist, at a salary of $125 per month, the engagement to be terminated at the end of six months if his services are not entirely satisfactory. He expects to assume the duties about June 12. Supplies and outfit for the laboratory—excluding furnishings—have been ordered at at an estimated expense of $600.

In connection with the use of the laboratory I wish to present the following as a draft of a proposed letter to superintendents of public institutions, should the Board deem it wise to take up this matter now:

TO SUPERINTENDENTS OF PUBLIC INSTITUTIONS IN OHIO.

Dear Sir: The State Board of Health invites your coöperation in a movement looking to the better protection of the public against consumptive patients. In the opinion of the Board educational and not compulsory measures should be used in dealing with this disease. Your attention is called to the enclosed pamphlet on the Prevention of Consumption, issued by the Board in 1894. This pamphlet has been widely distributed, and was published in a number of daily newspapers. The contagiousness of consumption is probably admitted by the vast majority of the reading public, yet there is reason to fear that even the simplest measures for its prevention are not generally observed. Example is better than precept, and our public institutions, which have in many ways already been public educators as well as guardians of the unfortunate and defective classes, are in a position to enforce lessons of the utmost utility as regards the care that should be taken in preventing the spread of tuberculosis. The State Board of Health has just established a laboratory where special attention is to be given to the diagnosis of microbic diseases. We place the laboratory at your disposal for the purpose of determining the number of inmates in your institution now suffering from tuberculosis. We hope you will avail yourself of this offer, and we will send you on request such number of sterilized bottles, prepared so as to be mailable, as you may wish for this purpose.

After having found all who are tuberculous among your inmates, we respectfully suggest that the following precautions be taken to protect those still free from the disease:

ISOLATION.

Isolation, or rather separation of the sick from the well, should be practiced to the greatest possible extent. It is realized that in many of our public institutions classification of the inmates is necessary, and that it may be difficult to group the tuberculous, but it has been demonstrated that this is not impossible. It is perhaps inadvisable to associate those in the incipient stage of the disease with those far advanced, and with copious expectoration. It may be permissible to allow many of the consumptive patients to associate with other inmates in the general dining room, in chapel, in the amusement hall, and out-of-doors, but not without special attention been given to them. The well and the tuberculous should never be permitted to sleep in the same dormitory.

DISINFECTION.

The cause of consumption is known to be a germ or micro-organism. It is found only in the sputum of a person suffering from that disease, when the lungs alone, which is usually the case, are affected. This makes the disease comparatively easy to deal with, for if we can promptly destroy the germs in the sputum of a consumptive there is little danger of his spreading the disease. When consumptives are permitted to spit promiscuously in dormitories, halls, workshops, etc., an institution may become permanently infected and a source of danger to all its inmates. It should be made a misdemeanor for a consumptive inmate to spit anywhere indoors except in receptacles provided for that purpose. It may be difficult to control patients of the defective class, but this is believed to be not impossible, as their habits are already constantly more or less controlled by a wise system of rewards and privations. Indoors, wherever consumptives are permitted to be, cuspidors containing a disinfectant solution should be plentifully provided. The patients should be taught to use them, and should be under observation as constantly as possible to see that this is done. Some one should be specially charged with the care of these cuspidors, and they should be thoroughly cleansed and disinfected, and have their disinfectant solution renewed each day. At night each patient should have a spit-cup containing a disinfectant solution, which should also receive daily care by the person who looks after the cuspidors. Rooms occupied by consumptives should be uncarpeted, with a non-absorbent floor surface, easily disinfected. Curtains at windows, and other draperies liable to become infected, should also be excluded.

In penal institutions, where prisoners are confined in cells, often badly lighted, the use of cuspidors by consumptives should be most vigorously enforced.

It would be advisable, in my judgment, before putting into operation the measures herein recommended, for all cells to be disinfected and painted or whitewashed. This should certainly be done in the case of all cells, dormitories or other closed rooms, known to have been occupied by consumptives. The bedding, clothing, towels and handkerchiefs used by consumptives should be laundered separately, and should be disinfected each time they are washed by boiling for not less than one hour. Unwashable goods, clothing or bedding, used by a consumptive, should not be used by any other person unless disinfected by heat or fumigation. It is believed that by strictly carrying out the measures above recommended, the danger of the spread of consumption among the inmates of our public institutions may be reduced to a minimum. At the same time an object lesson would be given to the general public, which would do much towards bringing such preventive measures into general use.

We hope to have your hearty coöperation in this matter, and we shall be pleased to hear from you in regard to it.

Very respectfully,

C. O. Probst, M. D.,
Secretary.

By order of the Board.

Another matter relating to the laboratory is the provision in the new law requiring the Board to make an annual report upon the condition of all public water supplies. I would suggest that the first thing in order is to obtain full information regarding the character of each public supply. This information is inaccurately given in the Manual of Amercan Water Works.

Mr. Flynn, who was engaged as an assistant in our examinations of the Lorain water supply, has made up the following table from the Manual for 1897, showing source, etc., of all public supplies in Ohio: [See inset.]

The manual obtains its information by having blanks filled by superintendents of water works, and, in regard to some of the places, I have reason to know that the information is not correct. It is especially important to know that a town having a limited supply of pure water is not making up periodical deficiencies by resorting to impure sources. I am somewhat doubtful about obtaining more accurate information by the means used by the authors of the Manual, *i. e.*, by circular letter, and I bring the suggestion before the Board as to whether it is of sufficient importance to send some one to all or most of our towns having a public water supply, to report thereon. I am inclined to believe that it would be wiser to drop our river examinations for the present year and devote the time and money which would have to be given to that work to making a comprehensive and accurate report upon the present condition of public water supplies. The laboratory could be used in this connection for such examinations of public supplies as are found necessary. It will be noted by the table of Mr. Flynn that 76 of the 148 towns having a

OHIO WATER SUPPLIES.

Population — Estimated population for 1898
Consumption — Average daily consumption
Method — Method of obtaining water pressure
Data from the Manual American Water Works for 1897

R — Pumping to reservoir
S — Pumping to stand pipe
D — Pumping direct
R & D — Pumping direct and to reservoir
S & D — Pumping to standpipe and direct
D & G — Pumping direct and by gravity
S & G — Pumping to standpipe and by gravity
G — By gravity

	Population
Alliance has gravel filters	[illegible]
Dennison has gravel filters	[illegible]
[illegible] has gravel filters	[illegible]
	[illegible]
Fostoria has sand filters	[illegible]
Findlay has sand filters	[illegible]
	[illegible]
Lorain has mechanical filters	[illegible]
Warren has mechanical filters	[illegible]
	[illegible]
Cambridge has filters	[illegible]
Total population using filtered water	[illegible]

Total number of cities and towns with water supplies [illegible]

Compiled by [illegible]

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public water supply, use ground water exclusively. Most of the towns of this class will need but one examination until some changes or extensions of the supply are made. This will leave a comparatively small number which use, in whole or in part, surface waters, *i. e.*, lakes, streams and ponds. The supplies of these cities, in my judgment, should be kept under more or less constant observation monthly, or perhaps only quarterly, laboratory examinations of the water being made. This use of our new laboratory in connection with this suggested inspection of, and report upon, all public water supplies will, I think, at once commend our laboratory to the public.

A case of smallpox was reported at Delphos May 22. The patient is a boy 16 years of age, who was taken sick May 11. A number of people were exposed to the disease before its true nature was recognized. The local board of health has inforced a strict quarantine, and up to this time no other cases have been reported.

I wish to call attention to the celebration of the Quarter Centennial of the Michigan State Board of Health, to be held in Detroit August 9 and 10, 1898. The Conference of State and Provincial Boards of Health will meet in Detroit at the same time. Notice should also be taken of the meeting of the American Public Health Association, which occurs before the next meeting of the Board. The Association will meet in Ottawa, Ontario, beginning on September 27, 1898.

Respectfully submitted,

C. O. PROBST,
Secretary.

OCTOBER MEETING.

A regular meeting of the State Board of Health was held at the Hotel Clarendon, Zanesville, Ohio, October 12, 1898.

Present: Drs. Hoover, Stanton, Kahle, Crossland, Gemmill and Mr. Hartzell.

The minutes of the last meeting were read and approved.

The Secretary presented his Quarterly Report which was ordered filed for publication.

Mr. W. L. Church, C. E., presented a letter from the mayor of East Cleveland, asking the State Board of Health to approve certain plans proposed for purifying the sewage of that village.

Mr. Church presented the plans.

On motion of Dr. Stanton, it was voted to appoint a committee to investigate and report upon the proposed sewage disposal works of East Cleveland.

Mr. W. J. Sherman, C. E., of Toledo, presented plans for extending the sewerage system of Napoleon, with a request that an outlet into the Maumee river be approved, and that three years' time be granted to the village to make arrangements for satisfactory purification of the sewage.

On motion of Dr. Stanton it was voted to approve the plans provided that arrangements, satisfactory to the State Board of Health, should be made for the purification of the sewage within three years from date.

It was voted to approve the proposed water supply for the following places: Salem, Chicago Junction, Dennison, Mingo Junction and Mineral Point.

It was voted to approve plans for sewerage for Ripley and Lebanon, plans for sewage disposal at Clyde, and the plans for sewerage for Winton Place, with such changes in plans as were recommended by the committee that reported upon them.

These places had all been visited by committees of the Board and reported upon, the reports having been approved by mail vote.

The Chair appointed Mr. Hartzell, Dr. Miller and the Secretary a committee to investigate and report upon plans for the purification of the sewage of East Cleveland.

A communication was presented from the board of health at Lakeside, requesting that one or more wells upon the Lakeside grounds be permitted to be kept open until April 1, 1899.

On motion of Mr. Hartzell, it was voted to instruct the board of health of Lakeside that permission might be granted to open what is known as the McKenzie well and allow it to remain open until April 1, 1899.

The Secretary presented a report upon the filtration of the water supply of Lakeside.

On motion of Dr. Stanton, it was voted to approve the report and the recommendations therein.

A communication was presented from Dr. H. M. Bracken, Secretary of the Minnesota State Board of Health, in regard to receiving bodies of persons having died of certain contagious diseases when prepared in accordance with the rules and regulations of that Board.

The letter was referred to the Secretary with the request that further information be obtained in regard to the preparation of these bodies.

On motion of Dr. Stanton, it was voted to arrange for a joint meeting of the State and local boards of health in Columbus, January, 1899, and the Secretary and President were appointed a committee to prepare a program.

On motion of Dr. Hoover, Mr. Hartzell was appointed a delegate from this Board to act with a committee of the American Public Health Association to wait upon the President of the United States to urge the formation of a commission to study the cause of yellow fever.

On motion of Dr. Stanton, it was voted upon adjournment to take a recess subject to the call of the President.

The Chair appointed Mr. Hartzell, Drs. Gemmill and Crossland members of the Finance Committee.

No further business presenting, the Board adjourned.

Attest. C. O. Probst, M. D.,
Secretary.

QUARTERLY REPORT OF THE SECRETARY.

Mr. President: Your Secretary has the honor to submit the following report of the conduct of the office since the last meeting of the Board, June 8.

The laboratory has been fitted up in a satisfactory manner for chemical and bacteriological work at a total cost to date of $786.24. A few additions may be needed as the work increases.

Examinations have been made of the Sandusky and Maumee rivers during July, August and September. The following stations were selected on the Sandusky river: Crestline, Bucyrus, Upper Sandusky, Tiffin, Fremont and Sandusky. Chemical and bacteriological examinations of the river have been made above and below each of these places excepting Sandusky. Here the water of the bay was examined at various points, and in one month, at various depths.

On the Maumee river examinations have been made as follows: At Findlay, Lima, Fort Wayne, Ind., Defiance, Napoleon and Toledo. Each one of these places has been visited by our engineer, Mr. Flynn, who has made a map of each place, locating all sewers and other sources of pollution, and collected as much information as possible concerning the water supply. He has completed his report of the Sandusky river, which may be properly submitted at this time. In addition to the places named he has visited, and is preparing maps of and reports upon the following places: Marysville, Upper Sandusky, Bucyrus, Crestline, Tiffin, Fremont, Sandusky, Findlay, Lima, Defiance, Napoleon, Toledo, Fostoria, Zanesville, Cambridge, Bellaire, Wheeling, Martin's Ferry, Bridgeport, Wooster, Steubenville, Wellsville, East Liverpool, Wadsworth, Toronto, Canton, Massillon, Uhrichsville, Dennison, Greenfield, Hillsboro, Cincinnati, Ripley, Harrison, Eaton, Marion, Springfield, Piqua, Greenville and Sidney.

Reports of the investigation of rivers of last year have been distributed as follows: To each State and Provincial Board of Health, to the boards of health of Ohio of all cities of over 4,000 inhabitants, to the engineers and superintendents of water works of all places where examinations were made last year, and to those of places under examination this year. To the prominent engineers of Ohio and other states, to the principal sanitary journals of this country, and to one or more in England, Scotland, France, Germany and Mexico. More than half of the reports are on hand, and will be judiciously placed from time to time. A number of letters complimenting the Board on this work have been received.

Since the last meeting of the Board the following visits have been made by a member of the Board or the Secretary:

Salem, water supply, June 10, Messrs. Hartzell and Stanton.

Chicago Junction, water supply, June 14, the Secretary.

Dennison, June 16, water supply, Mr. Hartzell.

Delphos, June 21, smallpox, Dr. Kahle.

Winton Place, June 27, sewerage, Dr. Stanton.

Delphos and Van Wert, June 28, smallpox, Dr. Kahle and the Secretary.

Bays, June 29, smallpox, the Secretary.

Ripley, June 30, inspection of sanitary condition, Dr. Stanton.

Marysville, July 2, sewerage, the Secretary.

Mingo Junction, July 5, water supply, Dr. Hoover.

Clyde, July 8, sewage disposal, the Secretary.

Delphos and Van Wert, July 11, smallpox, Dr. Kahle.

Goshen, July 26, smallpox, the Secretary.

Lakeside, July 30, inspection of water filters, the Secretary.

Van Wert, August 16, smallpox, Dr. Kahle.

Leipsic, August 17, nuisance, Dr. Kahle.

Ripley, August 17, sewerage, Dr. Stanton.

Lebanon, August 18, sewerage, Dr. Stanton

Put-in-Bay, August 30, smallpox, the Secretary.

Mineral Point, August 31, water supply, Mr. Hartzell.

Steinersville, September 8, typhoid fever, the Secretary.

Cincinnati, September 13, laboratory, the Secretary.

St. Mary's, September 19, smallpox, Dr. Kahle.

Dayton, September 20, smallpox, the Secretary.

New Paris and Wapakoneta, October 4, smallpox, the Secretary.

Uniopolis, October 6, smallpox, Dr. Kahle.

Reports have been made of most of these investigations; some remain for consideration now. The most important is that in regard to the numerous outbreaks of smallpox in the State. To consider these chronologically we may begin with Delphos. The first case reported here was Ira Graves, taken ill May 4. Two weeks prior to that date he attended the unloading of the car of "Uncle Tom's Cabin Show." It was reported that two members of the show company were suffering at the time from some eruptive disease. No proof of this was found. The attention of the Board was not called to the existence of smallpox in Delphos until May 23, when the health officer, in answer to a telegram, reported one case, and claimed that all necessary precautions had been taken to prevent spread of the disease. There were in all 15 cases, with no deaths.

A boy named Green was the first victim of smallpox in Van Wert. He was attacked May 14, but his disease was mistaken for chicken-pox until sometime after that date. It is thought that this boy was exposed to the disease in Delphos. Smallpox continued in Van Wert until September 1, with a total of 17 cases, and no deaths.

Near Bays, a small village in Wood county, a case was reported June 27 and was investigated on the 29th. The patient was a woman lately come from Pennsylvania to visit her brother. Subsequently her brother developed smallpox, but there was no further spread. Both patients recovered.

July 26, I was summoned to Goshen, a small village in Clermont county, to investigate suspected smallpox. The first case was a woman who developed the disease May 28. Her physician called it chicken-pox. Her two children contracted the disease. One of these a year before had had chicken-pox, thus leaving no excuse for the mistake in diagnosis. The disease slowly spread, chiefly among relatives of the woman first attacked. In all, there were 27 cases, but no deaths in Goshen and vicinity. Here again the disease was exceedingly mild, unvaccinated children going through with the disease without missing a meal, and with but a scanty eruption, leaving little or no pitting. The origin of the disease is uncertain, but it was somewhat significant, in connection with the Delphos outbreak, that the first patient attended the same "Uncle Tom's Cabin Show" just 14 days before taking down with smallpox.

Smallpox was reported at Put-in-Bay August 27, during my absence on vacation. I visited the place August 30, when there was still question as to the diagnosis. I was unable to fix the exact date of the first case, but it was several weeks prior to my visit, during which time 26 cases had developed. There had been one death. All but one of the patients were servants at the Hotel Victory, a large summer hotel. Twenty-one of them were colored. Most of the cases were exceedingly mild, the patients going about as usual, and the eruption in many cases not going beyond the papular stage. A few cases, however, were of considerable severity and well marked. The hotel was closed August 28, nearly all of the guests having departed on the 27th. Fortunately the hotel is isolated, and the patients and "suspects" could be cared for in the servants' quarters, a large detached building, and in tents. There was no further spread of the disease at Put-in-Bay, and I have not learned of its being carried elsewhere, with the possible exception of Sandusky. I had a conference with Mr. Parks, of Toledo, manager of the hotel, in regard to burning the building occupied by the patients. I was a loosely built summer house, difficult if not impossible to thoroughly disinfect. He consented to having the building burned, which was done October 4, the contents being destroyed with it. The origin of the Put-in-Bay cases was not learned. Most of the patients had come from Asheville, N. C., and other points in the South, and may have brought the disease with them. A large force of servants were employed, and these were constantly changing, and came from various parts of the country I have advised the hotel company, in order to avoid a repetition of their recent disaster, to require all their employes to be vaccinated before entering their service.

Early in September and at different times, three cases of smallpox were reported at Cincinnati. The origin of the disease could not be learned. The patients were removed to the branch hospital, and no other cases have been reported there.

On September 20, I was summoned to Dayton by telegram from the health officer, to see a case of smallpox. The patient was a servant in a family living in the central part of the city. The patient was in the first day of the eruption, but the disease was declared smallpox, and she was at once removed to the smallpox hospital. The origin was not then known, although it was learned that the patient had visited Wapakoneta two weeks before. Smallpox was not then known to exist in Wapakoneta. There has been no spread of the disease at Dayton.

September 22, a case of smallpox was reported in Sandusky. The patient had come from Hotel Victory, Put-in-Bay, but seven weeks before being taken ill. Quarantine and vaccination of exposed persons, prevented extension of the disease.

On September 26, the health officer of Oberlin reported a case of smallpox by telegram. In a letter following he stated that the patient was a traveling man for a grocery house in Toledo. The man came to Oberlin September 21, sick at the time, and his disease was diagnosed smallpox on the 26th. Proper precautions were taken and the disease did not spread. Origin unknown.

During my absence in Canada the health officer of Dayton sent to the office the following letter which he had received from Dr. G. B. Nichols, of Wapakoneta:

WAPAKONETA, OHIO, September 26, 1898.

Dr. Bonner, Health Officer, Dayton, Ohio:

DEAR DOCTOR: Would you please inform me by next mail what disease Miss Kirchner, of Wapakoneta, O., (but now reported to be in your city and under your care) has been diagnosed by you? I have learned that, or rather been informed that her case is one of variola. We have had here during the last three or four months what has been pronounced by all our local physicians an epidemic of varicella, a great many of them mild and some very severe, but all recovering in from two to four weeks with no umbilicated pustules, but simply vesicles which leave very few scars, but which attacks our people of all ages from infancy to senility, affecting even the mucous membranes of mouth and throat. The eruption is preceded in some cases by temperature of 104 but soon going to normal after eruption appears. The vesicles are in a great many portions of the body confluent. In some cases there is no doubt but that there are at least one thousand (1,000) pocks or vesicles erupted on the body, covering all parts and especially the face and extremities, but as I have before stated *there are no umbilicated pustules, very few scales*, and all cases recover in from two to four weeks. A number of families have had one or two cases in their homes, with the other members of the family, say some three or four, and all fully exposed, escaping.

Now, please inform me soon as possible, what yourself, or any other physician, have concluded this young lady (Miss Kirchner) has, and greatly oblige me.

Yours truly.

(Signed) G. B. Nichols, M. D.

This letter was shown to the President, Dr. Hoover, who instructed the clerk to call the attention of the board of health of Wapakoneta to the matter, and to say that the disease they were having was undoubtedly smallpox. This was done September 28. The mayor of Wapakoneta called a council of physicians and had them examine a suspected case. They pronounced it smallpox, and the board of health then established quarantine over 12 houses where the disease was known to exist. On my return from Canada I found a letter from the mayor of Wapakoneta asking me to come there and decide the question of diagnosis, as their physicians were still divided in opinion, and it was impossible to enforce proper restrictive measures. I went there October 4, stopping at New Paris to see another case of smallpox by request of the health officer. I visited several of the cases and pronounced the disease smallpox. I made notes of these cases and will give those relating to two only: Arlie Miller, male, age 21 years, never vaccinated, never had chicken-pox, was repeatedly exposed to Sophia Weber between September 6 and 9, who then had a mild attack of an eruptive disease, was taken ill September 21, had headache and fever, temperature on the 23d, 103.4 with vomiting; temperature on the 24th, 104.5; eruption appeared on the 24th on forehead, face, wrists and hands, and extended over the whole body. Eruption macular, papular, vesicular and pustular, with umbilication of some pocks. A marked drop in temperature (not taken) on the 25th, with a subsidence of all the symptoms. There were five unvaccinated children in this family.

Ethel Miller, age 13 years, never vaccinated, had chicken-pox three years ago. Taken ill September 25, headache, pain in the limbs, nausea. Temperature on the 26th, 104.2; eruption appeared on the 28th on forehead, face, wrists, and spread over the whole body. Eruption passed through usual stages, and was distinctly pustular October 4. There was a rapid decline of the fever after the eruption appeared. Fourteen days before taken ill she was sent to the Kirchner family for some linen which had been washed by them. This is the family to which the Dayton case belongs, several cases of the so called chicken-pox having occurred there. You will please note that this patient had had chicken-pox three years before. I learned that cases of this disease had occurred in Wapakoneta as far back as April of this year. Some of them had been severe, but most of them exceedingly mild. In many cases no physician was called. Most of the cases were children, it is claimed, but adults did not escape. The disease spread to the surrounding country, and many cases occurred there. No precautions whatever were taken to check it. It is estimated that between two and three hundred cases have occurred. But one death is reported. and that a young, weakly babe brought to Wapakoneta from the country on a cold day, and is thought to have died from exposure. It is claimed that in numerous instances unvaccinated persons in families where the disease prevailed, escaped, though constantly exposed to infection.

It is not impossible that smallpox and chicken-pox have been prevailing at the same time at Wapakoneta, but I am inclined to the opinion that all of their cases have been smallpox. This is certainly the most remarkable epidemic of smallpox of which I have knowledge, and I would suggest that a proper person be employed to collect information which will enable a complete history of it to be made, simply as a contribution to medical literature. I held a long conference with the mayor of Wapakoneta, who seemed to have taken health matters into his own hands, and gave him written instructions for dealing with the disease.

October 8, the mayor of Wapakoneta telephoned that vaccination was being pushed; that a number of houses of persons recovered from the disease had been disinfected; that some additional cases had been discovered, making a total of twenty cases in eighteen different houses under quarantine. Later he reported 14 cases in 12 different houses.

The patient with smallpox at New Paris, Preble county, is a traveling salesman. He was taken ill September 26. He had attended the fair at Wapakoneta, which closed September 9, and left there that day. If his exposure be credited to Wapakoneta this would make an incubation period of 17 days. It is more than likely that he was exposed after leaving Wapakoneta.

On October 6, Dr. Kahle of our Board reported a case of smallpox at Uniopolis, near Lima, which he had investigated.

On October 7, the health officer of St. Mary's reported four cases of smallpox, all in one house. The first case is traceable to Wapakoneta.

On October 9, the health officer of Dayton, Dr. Bonner, telephoned me that he had just learned that a sister of the smallpox patient at Dayton, who lives in Sandusky, was probably going through an attack of smallpox unknown to the authorities of Sandusky. I notified the health officer of Sandusky, who, after investigation, reported that the woman in question had a mild attack of smallpox. She had visited her home in Wapakoneta (this same Kirchner family) two weeks before she was taken ill in Sandusky. She was attacked about the 29th of September, so there were doubtless many people exposed. It is probable that we shall have a considerable number of other cases of smallpox appearing as the result of exposure at Wapakoneta and other places.

In accordance with instructions given at the last meeting, Mr. B. H. Flynn has been engaged for engineering work in connection with the report upon the condition of public water supplies obtained from surface sources.

THE LABORATORY.

The laboratory has become one of the most important aids in sanitary work. From the laboratory have come discoveries concerning the causes of disease, which have enabled the practical sanitarian to direct his work of prevention with much greater precision. The microscopical enemies of man which before escaped his ken, are gradually giving up their life history to the patient bacteriologist who is following them step by step; who is showing us their hiding places, the conditions favoring their growth and malignancy, their manner of attack, and the agents best fitted for their destruction. Not resting here, the laboratory is teaching us how good may be evolved from evil; how the deadly poisons of disease generated by the microscopic plague producers may be turned into weapons against the very diseases they engender. Having in mind the recent discoveries regarding the cause and cure of diphtheria, who would dare to predict the future of preventive medicine.

It is little to the credit of this country that our National Government has done nothing to encourage original research work for the prevention of diseases among human beings. Our animals, with a market price, are receiving some attention, but our crying need for a National laboratory, where an adequate study may be made of the causes and the means of prevention of the diseases of mankind, continues to be neglected.

A laboratory for State work finds its greatest usefulness in the prevention of disease. In assisting the medical practitioner in recognizing obscure cases of diphtheria, typhoid and malarial fever, and tuberculosis; in determining the period during which such diseases are communicable to others, and the duration of quarantine; in determining the efficacy and proper methods of use of various disinfectant agents; in locating the cause of outbreaks of typhoid fever by the examination of suspected drinking waters—in these and other ways a laboratory has come to be an indispensable aid to state boards of health in their work of protecting the public health.

We feel that Ohio is to be congratulated in having made provision for a laboratory which will enable the Board to greatly extend its usefulness. By an act of the General Assembly, passed April 25, 1898, the State Board of Health was authorized to establish a laboratory for the examination of public water supplies, the effluent of sewage purification works, for the diagnosis of diphtheria, typhoid fever, hydrophobia, glanders, and such other diseases as they may deem necessary, and for the examination of food suspected to be the cause of disease. No appropriation was made for fitting up the laboratory, or for carrying on the work, and all expenses are to be paid from the regular appropriation of the Board.

The Board was fortunate enough to secure the services of Mr. Elmer G. Horton, B. S., who came highly recommended from the Laboratory of Hygiene of the University of Pennsylvania. The work and training of Mr. Horton have specially fitted him for having charge of a laboratory exclusively devoted to sanitary examinations. The laboratory was fitted up under his personal supervision. Two rooms, suitable for laboratory purposes, located in the top story of the Board of Trade building, opposite the Capitol, were rented for $15 per month. Only a modest sum was available for equipment, but care has been taken that all instruments and supplies purchased should be of first quality. Additions to laboratory equipment will be made as the growth of the work requires.

The following circular of information, a copy of which was sent to each local board of health, will show the direction and scope of the work which, for the present, will be done at the request of the local health authorities:

INFORMATION CONCERNING THE USE OF THE LABORATORY OF THE OHIO STATE BOARD OF HEALTH.

To Local Boards of Health:

The State Board of Health, by authority of the Legislature, has established a laboratory for chemical and bacteriological examinations of a sanitary character. No extra appropriation was made for fitting up the laboratory or for carrying on the work.

One of the requirements of the act establishing this laboratory was that the Board should carry on a systematic examination of the sanitary condition of all streams in Ohio, and of all public water supplies. The exigencies of this part of the work, and the lack of funds for increasing laboratory facilities, make it imperative, for the present, to limit the use of the laboratory in other directions.

The laboratory is to be placed at the disposal of local boards of health and not of the general public; and examinations of water, of food and for the detection of pathogenic bacteria, etc., will only be made on the request of such boards. All examinations will be made free of charge, excepting the cost of transporting samples.

In diphtheria, it is not the expectation that every case reported to the local authorities will require a bacteriological examination. In most cases physicians will be able to easily recognize the disease. Cases occur, however, in which the diagnosis is uncertain and only to be determined by bacteriological methods, and where, consequently, quarantine measures are with difficulty enforced. In some instances there may be a difference of opinion among physicians as to the character of some prevailing throat trouble. Laboratory examinations will be promptly made in all cases of this kind.

On application from the board of health sterilized swabs, with instructions for collecting material for examination from the throats of suspected cases, will be sent to the board. These should be given to the attending physician, who should use them and return them to the State Board of Health as soon as possible. The results of the bacteriological examination will be reported both to the board of health and to the attending physician. If requested, this report will be telegraphed, but at the expense of the person requesting telegraphic report.

It will be impracticable with our present laboratory force to examine cases of diphtheria after recovery to determine the time when diphtheria bacilli are no longer present in the throats of patients. Boards of health should continue to enforce the rule requiring quarantine of diphtheria cases for 14 days from the disappearance of all throat symptoms.

Physicians may make use of the laboratory, under the conditions given herein, by having the request for examinations come from their local board of health. As soon as laboratory facilities can be increased, arrangements will be made for extending the use of the laboratory in the bacteriological diagnosis of doubtful cases of contagious disease.

EXAMINATIONS FOR SUSPECTED DIPHTHERIA, TYPHOID FEVER AND TUBERCULOSIS.

Examinations will be made for the diagnosis of diphtheria, typhoid fever and tuberculosis, but only on the following conditions:

(*a*) The request for examination must come from the board of health.

(*b*) Information required by the State Board of Health must be furnished with the specimen sent for examination.

(*c*) Specimens must be secured in strict compliance with the directions of, and sent in mailing cases furnished by the State Board of Health.

(*d*) The local board of health must agree to place with the family of the patient, where the examination indicates the disease to be diphtheria, typhoid fever or tuberculosis, a pamphlet dealing with the prevention of the disease, to be furnished by the State Board of Health.

EXAMINATIONS OF WATER.

PRIVATE WELLS. (*a*) The examination of private wells will be undertaken only when good reasons for suspecting the well to be the cause of some water-borne disease are furnished in advance.

(*b*) The request for the examination must come from, and the sample of water must be furnished by the board of health.

(*c*) The sample must be collected in accordance with directions given, and sent in bottles furnished by the State Board of Health.

(*d*) The sample must be accompanied by such information concerning the well and the cases of sickness as the State Board of Health may demand.

(*e*) The local board of health must permanently close the well or enforce such other measures as may be given by the State Board of Health, if the examination shows it to be polluted and the probable cause of disease.

PUBLIC WATER SUPPLIES. (*a*) Examinations of a public water supply will be undertaken, upon the request of the board of health, whenever satisfactory information is furnished to show that it is the probable cause of disease.

(*b*) Other conditions to be complied with in making examinations of this character, will be determined by the State Board of Health in each case.

FOOD SUPPLIES.

(*a*) No examinations will be made for suspected adulteration of food, another State department having been established for such work.

(*b*) Examinations of food will be made upon the request of the board of health, proper samples being furnished, when satisfactory information is given to show that it was the probable cause of sickness.

FORMS FOR REPORTS AND INSTRUCTIONS FOR COLLECTING SAMPLES.

Form L. 1. *Laboratory No:*........

DATA FOR EXAMINATION OF SUSPECTED DIPHTHERIA.

Patient's name, ... P. O. address, ...
Physician's name, ... P. O. address, ...
Has this case been reported to us? .... When? ....
Patient's age, ... Sex, ... Color, ... Temperature,...............
How long since disease commenced? ....
Where is membrane present? ....
Has antitoxin been used? .... Number units, ... Date used, ...
What antiseptics have been used in mouth or throat, ...
Number of hours between last use of antiseptic and collection of specimen, ...

Remarks : ....

Physician's diagnosis, ...

Date of collection, ...

(Hour) (Day) (Month) (Year)

Received at laboratory, ...

(Hour) (Day) (Month) (Year)

Do you wish telegraphic report, at your expense? ....

Name of sender, ...

P. O. address, ... County, ...

☞Return the case by mail without wrapping. Return this blank by same mail to the *Laboratory of the Ohio State Board of Health.*

Form L. 2.

DIRECTIONS FOR COLLECTION OF SPECIMEN FOR DIPHTHERIA EXAMINATION.

The patient should be placed in a good light, and, if a child, properly held. Obtain a good view of the throat by depressing the tongue, then rub the cotton swab gently but freely against any visible exudate, and also against the mucous membrane of the fauces, pharynx or posterior nares. Do not allow any antiseptic gargle or spray to be used for at least four hours prior to time of inoculating the swab. Take especial care that the swab touches nothing but the infected area either before or after using. Immediately replace the swab in the tube and replug the tube, which should then be carefully packed in the laboratory case and at once mailed, postage prepaid, to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

Fill out the accompanying blank and return by same mail to the laboratory.

Form L. 3. *Laboratory No.........*

DATA FOR EXAMINATION OF SUSPECTED TYPHOID FEVER.

Patient's name, ... P. O. address, ...

Physician's name, ... P. O. address, ...

Has the case been reported to us? .... When? ....

Patient's age, ... Sex, ... Color, ... Temperature, ...

How long since disease commenced? ....

What is the supposed source of infection? ....

When, if ever, has patient had typhoid fever? ....

Remarks : ....

....

Physician's diagnosis, ...

Date of collection, ...

(Hour) (Day) (Month) (Year)

Received at laboratory, ...

(Hour) (Day) (Month) (Year)

Do you desire telegraphic report, at your expense? ....

Name of sender, ... P. O. address, ...

☞Return this blank by mail with specimen to the *Laboratory of the Ohio State Board of Health.*

Form L. 4.

DIRECTIONS FOR COLLECTING BLOOD FROM A SUSPECTED CASE OF TYPHOID FEVER.

As the examination is made from dried blood, several drops should be obtained in the following manner:

With boiled water wash the lobe of the ear, the end of a finger, or in an infant the end of a toe. Pierce the skin with a clean needle or scalpel and by means of the wire loop in the envelope, transfer four or five drops of blood to individual places on the aluminum foil. Make the foil into a roll with the blood inside, taking care not to smear the blood; flatten one end of the roll and double the edge to prevent unrolling *After the blood has dried,* flatten the whole roll and double the other end; replace the roll and loop in the envelope; enclose in a larger envelope with the *data blank filled out in full and mail* to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

Form L. 5. *Laboratory No........*

DATA FOR EXAMINATION OF SUPPOSED TUBERCULOUS SPUTUM.

Patient's name, ... P. O. address, ...
Physician's name, ... P. O. address, ...
Has the case been reported to us? .... When? ....
Patient's age, ... Sex, ... Color, ... Temperature, ...
How long since disease commenced? ....
Remarks: ....
....
Physician's diagnosis, ...
Date of collection, ...
(Hour) (Day) (Month) (Year)
Received at laboratory, ...
(Hour) (Day) (Month) (Year)

Do you desire telegraphic report, at your expense? ....
Name of sender, ... P. O. address, ...

☞Return the case by mail without wrapping. Return this blank by same mail to the *Laboratory of the Ohio State Board of Health.*

Form L. 6.

DIRECTIONS FOR COLLECTING SPUTUM IN SUSPECTED CASES OF PULMONARY TUBERCULOSIS.

The sputum should be obtained in the morning before the patient has taken milk or food. Collect bronchial and not pharyngeal secretions. The sputum should be received in a perfectly *clean* receptacle and transferred to the vial furnished by this laboratory. After securely screwing down the cover, wash the outside of the vial repeatedly with clean water. Enclose the vial in the laboratory package and forward at once by mail to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

Fill out the accompanying blank and return by same mail to the laboratory.

Form L. 7. *Laboratory No.........*

INFORMATION REQUIRED FOR THE EXAMINATION OF WATER.

1. No. of sample, ...
2. Date of collection, ...
   (Hour) (Day) (Month) (Year)
3. Name of owner of well, ...
4. Location, ...
   (Town or township, and county.)
5. Kind of well, ... Specify whether dug, driven or drilled.
6. Depth, ... Depth to water, ...
7. Formation of soil pierced by well, ...
   ....
8. How is well protected against surface washings? ....
   ....
9. Character and distance from well of other sources of pollution, ...
   ....
   ....
10. Number of persons using well for drinking purposes, ...
11. Number of such persons now or recently ill, ...
12. Character of illness, ...
13. Number of deaths among users of well, ...
14. If possible, furnish sketch showing relation and distance of well from possible sources of pollution.
15. Name of sender of sample, ...
16. P. O. address, ...

☞This blank must be properly filled out and returned to the *Laboratory of the Ohio State Board of Health* with the sample to be examined.

Form L. 8.

DIRECTIONS FOR COLLECTING SAMPLES OF WATER FOR CHEMICAL EXAMINATION.

Water which has been standing in a pump or pipe is not a fair sample and such water should be removed before the sample for examination is taken. If the sample is from a pond or stream it should not be collected close to the bank nor directly from the surface of the water.

The bottle is not to be opened until the sample is to be taken. After rinsing the bottle thoroughly with the water in question, fill it, and firmly replace the stopper. The portion of the stopper which enters the bottle must not touch the hands of the collector or other object.

Place the bottle in shipping case, number it on attached card, prepay charges, and send as soon after collection as possible to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

Properly fill out Form L. 7 and return with key to the box by first mail to the laboratory.

Samples should not be collected so as to be en route over Sunday, nor should they reach the laboratory on Saturday.

Form L. 9.

INSTRUCTIONS FOR COLLECTING SAMPLES OF WATER FOR BACTERIOLOGICAL EXAMINATION.

To insure reliability of results in the bacteriological examination of water, the greatest care should be exercised in the collection and shipment, and accordingly only those samples will be accepted which have been collected and shipped as follows: The water must be collected in bottles sent out from the laboratory for this purpose, and these bottles must not be opened until immediately before filling. Under no circumstances must any foreign object (especially the hands of the collector) come in contact with the mouth of the bottle or that part of the stopper which enters the bottle.

When the water is to be taken from a well the pump should be operated for several minutes before the sample is collected. From a hydrant or tap the water should likewise be allowed to run for some minutes before taking the sample. In ponds or streams the sample should not be taken close to the bank, nor directly from the surface.

Rinse the bottle once or twice with the water in question, then fill, carefully stopper, replace the covering, *pack in ice and sawdust*, and send by express to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

Samples should not be collected so as to be en route over Sunday, nor should they reach the laboratory on Saturday.

GLANDERS.

Glanders, a more or less frequent disease of horses, may be communicated to man. Where there is good reason to suspect that this has occurred the diseased animal, if alive, may be subjected to injections of "mallein," which can be done by any competent veterinarian, and in most cases it will be possible to recognize the disease by this method.

When it is necessary to make a bacteriological examination for diagnostic purposes, fresh specimens (nasal discharges, a portion of the lung, gland or ulcer) should be secured, using cleanliness, but no antiseptics, and placed in jars or glass vessels, sterilized by previous boiling, and sent by express to the laboratory, securely packed in ice. Full information must be furnished concerning the animal from which the specimens are sent, and a clinical history by the attending physician of any cases in human beings suspected to have occurred from contact with such animal.

All specimens should be sent to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

RABIES. (HYDROPHOBIA.)

Hydrophobia in man is an exceedingly rare disease, and there is usually little reason for the "mad dog scares" which are of such frequent occurrence.

When an animal, which has bitten some person, dies from or is killed on account of hydrophobia, and an examination is required for diagnostic purposes, the head and neck, packed securely in ice, should be sent by express to the laboratory as soon after the death of the animal as possible.

The specimen must be accompanied by as full information as can be obtained concerning both the suspected animal and the persons who have been bitten by it.

As susceptible animals must be inoculated in making this examination. and the results noted, it may be several weeks after the receipt of the specimen before a report can be made.

All specimens should be sent to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

TRICHINOSIS.

This is a frequent disease of hogs, and is caused by a parasite which can usually be found by the microscope. Persons eating pork infected with this parasite may contract the disease. In suspected cases of this kind an examination will be made on request of the board of health. Several pieces of the muscular tissue of the hog supposed to have caused the disease, taken, preferably, from the abdominal muscles, the diaphragm and the muscles of the neck, should be properly packed and sent to the laboratory. If sausage is suspected, a sample of that should be sent. The use of the suspected meat or sausage should be stopped until a report of the examination can be made.

The names, ages and residence of all persons suspected to have trichinosis must be reported to the State Board of Health. A clinical history of the cases, as furnished by the attending physician, should also be sent if obtainable.

All specimens should be sent to the *Laboratory of the Ohio State Board of Health, Columbus, Ohio.*

GENERAL INSTRUCTIONS.

All materials to be examined for the presence of pathogenic bacteria are to be regarded as dangerous to all persons handling them; therefore, they should not only be packed so as to insure against possible breakage or leakage, but where any doubt exists as to the contamination of the receptacles in which they are contained, the whole exterior, after sealing, should be thoroughly disinfected by corrosive sublimate (1–500) or carbolic acid (5 per cent.).

All the samples and specimens sent in for examination, except in strict accordance with the requirements given herein, will be rejected.

It should be noted that it is a violation of the postal laws to send diseased tissues, sputum, etc., by mail except in containers approved by the Postoffice Department.

Health officers will please present this circular to their respective boards of health, and a copy of it should be retained among the permanent records of the board.

Very respectfully,

C. O. Probst, M. D.,

Director of the Laboratory and Secretary of the State Board of Health.

By order of the Board.

It is not the wish of the Board to limit its services to the local authorities in the way of laboratory examinations. On the contrary the Board would gladly open its laboratory for all necessary examinations of a sanitary character. It is confidently expected that appropriations will be made to meet legitimate demands upon the laboratory.

One of the reasons the Board had for asking for a laboratory of its own was to provide means for the examinations required in its investigation of rivers. As has been noted elsewhere, the Board has undertaken an investigation of all the important streams of the State, and has published a special report upon the work done in 1897. A report of the investigation of the Sandusky and Maumee rivers, made during the year 1898, is given on another page. The large number of chemical and bacteriological examinations required in this river work has necessarily occupied much of the time of the laboratory, limiting work in other directions.

A notable feature of the act establishing a laboratory is that requiring the State Board of Health to report annually upon the condition of all public water supplies. The full measure of benefit to be obtained from this cannot be reached until the Board is placed in position to carry on continued examinations at short intervals of the water furnished by the various corporations and water works companies. Public sentiment is now strongly in favor of pure water. The mass of the people are well informed as to the causal relation of polluted drinking water to certain forms of disease. Sanitary engineering has pointed out the way of obtaining naturally or artificially purified waters. It remains for the State Board of Health to determine the character of water supplies now in use, to show the source, character and degree of their pollution, and the effect of the use of contaminated supplies upon the health of the people. The laboratory, properly extended and directed, will be a most important factor in reaching the solution of these questions.

The following examinations were made in the laboratory from its opening, July 6, 1898, to January 1, 1899:

RIVER EXAMINATIONS.

Place.	Source.	Number of chemical examinations.	Number of quantitative bacteriological examinations.	Number of dissolved oxygen examinations.
Crestline, above	Sandusky river	2	2	2
" 2 miles below	"	5	5	5
" 3 "	"	1	0	0
Bucyrus, above	"	5	5	5
" below	"	5	5	5
Upper Sandusky, above	"	5	5	5
" below	"	5	5	5
Tiffin, above	"	5	5	5
" below	"	5	5	5
Fremont, above	"	5	5	5
" below	"	5	5	5
Sandusky	Sandusky bay	5	10	5
Findlay, above	Blanchard river	5	6	5
" below	"	5	5	5
Lima, above	Ottawa river	5	5	5
" below	"	4	5	5
Ft. Wayne, Ind., above	St. Mary river	5	5	5
" "	St. Joseph river	4	4	4
" below	Maumee river	5	5	5
Defiance, above	"	5	5	5
" below	"	5	5	5
" above	Auglaize river	5	5	5
Napoleon, "	Maumee river	5	5	5
" below	"	5	5	5
Toledo, above	"	5	10	5
" Cherry street	"	5	5	5
" Riverside park	"	5	5	5
		126	137	126

SPECIAL WATER EXAMINATIONS.

Place.	Source of sample.	No. of analyses.		Result of chem. anal.	Result of bact. analyses.	
		Chem.	Bact.		No. bacteria per c. c.	Character of bacteria.
Columbus	Blind Asylum, well	1	2	Usable	37	Water bacteria.
“	“ faucet, 4th floor	1	2	“	407	“
“	“ well	1	2	“	16	“
“	“ faucet, 4th floor	1	2	“	642	“
“	“ well	1	2	“	42	“
“	“ faucet, 3rd floor	1	2	“	370	“
“	“ well	1	2	“	110	“
“	“ “	0	2		38	“
“	“ “	1	2	Usable	5	“
Wadsworth	Hydrant	1	0	“		
Lancaster	Deep well, Industrial School	1	0	Unsatisfac'y		
“	“ “	1	0	Good		
Chillicothe	Spring	0	2		84 280	Colon not found.
Tiffin	Tap in city	1	0	Suspicious		
“	“	1	0	“		
“	Well, private	1	2	Polluted	3,570	Colon present.
“	“	1	2	“	4,010	“ “
Hillsboro	Spring	0	2		1,120	“ not found.
“	Well	0	2		1,990	“ “
“	Well at water works	1	0	Usable		
“	Hydrant	1	0	“		
Glouster	Test well	1	0	Impure		
Corning	Well, private	0	2		334,000	Colon present.
“	“	0	2		3,460	“ “
“	“	0	2		15,510	“ “
“	“	0	2		1,430	“ not found.
“	“	0	2		3,420	“ “
“	“	0	2		1,930	“ present.
Lisbon	“	0	2		16,740	“ “
“	“	0	2		114,390	“ “

Special Water Examinations—Continued.

Place.	Source of sample.	No. of analyses.		Result of chem. anal	Result of bact. analyses.	
		Chem.	Bact.		No. bacteria per c c.	Character of bacteria.
Lisbon	Well, private	0	2		38,180	Colon present.
"	"	0	2		640	" not found.
"	"	0	2		5,828	" "
"	"	0	2		31,760	" present.
"	"	0	2		64,700	" "
"	"	0	2		119,800	" "
"	"	0	2		22,340	" "
"	"	0	2		9,700	" "
Chagrin Falls	"	1	0	Polluted		
Mineral Point	Upper spring	1	0	Good		
"	Lower "	1	0	Usable		
"	Mine "	1	0	Good		
Steinersville	Well, private	1	2	Polluted	238,500	Colon present.
"	"	1	0	"		
"	"	1	0	Usable		
Lisbon	"	0	2		6,520	Colon present.
London	"	1	2	Suspicious	3,800	Putrefactive.
Caldwell	"	1	0	"		
"	"	1	0	"		
Glenmount	"	0	2		1,100	Colon present.
Perryton	Spring	0	2		1,395	Suspicious.
Rawson	City well	1	0	Good		
"	Well	1	0	Polluted		
New Carlisle	Well, school	1	0	Good		
Marietta	Cistern	0	1			Colon present.
Hallsville	Well, private	0	2		1,100,000	" "
"	"	0	2		960	" "
"	"	0	2		1,670	" "
West Liberty	"	0	2		14,020	" "
Armstrong Mills	"	1	2	Polluted	254,600	" "

SPECIAL WATER EXAMINATIONS—Concluded.

Place.	Source of sample.	No. of analyses.		Result of chem. anal.	Result of bact. analyses.	
		Chem	Bact.		No. bacteria per c. c.	Character of bacteria.
Claridon	Well	1	0	Unsatisfac'y		
Avenue	Well. private	0	2		845	Colon present.
"	"	0	2		6,875	" "
Clintonville	Well, school	1	2	Usable	182	" not found.
Lima	City water	1	2	Impure	2,860	" present.
"	"	1	2	"	2,780	" "
Chatham	Well, private	0	1			" not found.
Lakeside	Unfiltered lake water	1	1	Undesirable	350	
"	Effluent filter tank No. 1	1	1	Usable	590	The filters had been filled from the bottom with unfiltered water, and had just been put in operation a short time previously.
"	" " 2	0	1		523	
"	" " 3	1	1	Usable	610	
Totals		39	96			

71 samples.

ICE ANALYSES.

BACTERIOLOGICAL—QUANTITATIVE AND QUALITATIVE.

No. of samples.	Place.	Source.	Number of bacteria per c. c.	Presence of intestinal bacteria.
1	Lakeside	Lake Erie	615	Test not made
1	"	"	23,400	"
1	Dayton	Artificial ice	None	Colon not found
1	"	Small lake fed from canal	238	" present
1	"	Miami river	13	" not found
1	Circleville	Pond	115	" "
1	"	Canal below city	13,250	" present
1	Kenton	Pond	28	" not found
1	"	Scioto river	1,780	" present
1	Tiffin	Sandusky river	84	" "
1	"	Rock creek	283	" not found
1	Niles	Mosquito creek	63	" "
1	Warren	Mahoning river	67	" found
1	"	" in town	43,750	" "
1	Newark	Small piece	14,060	" "
1	"	Large piece	598	" "

16 quantitative.
14 qualitative.
Total, 16 samples and 30 analyses.

Of 14 samples examined for intestinal bacteria, eight samples contained colon bacilli.

BACTERIOLOGICAL EXAMINATIONS IN CONTAGIOUS DISEASES.

No. of samples.	Place.	Physician's diagnosis.	To be examined for	Results.
1	Lima	Tuberculosis	Tubercle bacilli	Tubercle bacilli found.
1	Steinersville	Typhoid	Widal reaction	Reaction negative.
1	"	"	"	" "
1	"	"	"	" "
1	Perryton	"	"	" positive.
1	Dillonvale		Diphtheria bacilli	Dipht'ria bacilli present.
1	"		"	" not found.
2	Piqua	Tonsillitis	"	" "
2	"	"	"	" present.
1	"	Doubtful	"	" "
1	"	Diphtheria	"	" "
1	"	"	"	" not found.
1	Nebraska	"	"	" present.
1	Antwerp	Scarlet rash	"	" not found.
1	"	Laryngeal croup	"	" present.
1	Harper	Cold	"	" "
3	Jackson	Diphtheria	"	" "
1	"	"	"	" not found.
1	"		"	" present.
1	Camden	Diphtheria	"	" "
1	Bellevue	Sore throat	"	" "
2	"	Diphtheria	"	" "

Totals, Tuberculosis	1
Typhoid	4
Diphtheria	22
	27

MISCELLANEOUS EXAMINATIONS.

No. of samples.	Place.	Nature of sample.	Cause for examination.	Result of examination.
1	Hillsboro	Water	Objectionable odor, taste and appearance	Crenothrix kühniana.
1	"	"		Negative.
1	Lewisburg	Insects	Harmful	Atropos divinatoria and clothilla pulsatoria.
1	Orrville	Worms	Presence in drinking water	Planaria.
1	Croton	Pork	Trichinosis	Trichina spiralis.
1	Newark	"	"	Negative.
1	Buckeye city	Jaw of hog	Tuberculosis	Abscess from alveolar periostitis.
1	Marietta	Milk	Typhoid	Colon bacilli present.
38	Lakeside	Filtered and unfiltered water	To test efficiency of sand filters	
24	"	do	do	

70 examinations.

SUMMARY OF LABORATORY EXAMINATIONS.

July 6, 1898, to January 1, 1899.

	No. of samples.	No. chemical examinations.	No. of bacteriological examinations.	Dissolved oxygen tests.
River work	127	126	137	126
Special waters	71	39	96	
Ice	16		30	
Contagious diseases	27		27	
Miscellaneous	70		70	
Totals	311	165	360	126

Total number of all kind of examinations, 651.

The expenses of the laboratory during the six months ending December 31, 1898, have been as follows:

Fitting up laboratory	$ 698 20
Supplies	134 78
Salaries	1,158 34
Traveling expenses of bacteriologist	242 30
Rent	112 50
Janitor	57 75
Miscellaneous	6 90
Total	$2,410 77

CONTAGIOUS DISEASES.

REPORT OF AN INVESTIGATION OF DIPHTHERIA AT PORT CLINTON.

To the State Board of Health:

Gentlemen: In response to a telegram from the Secretary, I went to Port Clinton October 23, and found the board of health in session and awaiting my arrival. It was evident they were very much in earnest in their efforts to stamp out the epidemic of diphtheria which had caused nine deaths, and the indications were that there would be many more fatal cases. I met with the board in their session in the morning and learned what they had been doing. They had adopted the rules of the State Board of Health, and had added some very stringent rules. They had just recently organized, and appointed the village marshal health officer, and one of the physicians of the village, assistant health officer. The schools were closed and the children were kept off the streets.

I learned that there were then 20 cases of diphtheria in 16 families, and that the marshal was kept busy looking after the provisions, etc., for those who were quarantined.

The board adjourned to meet again in the afternoon, and I visited several cases in the meantime with Drs. Porter and de la Barre, and saw several mild, but well defined cases of diphtheria.

In the afternoon when the board met we recommended that they appoint a physician as health officer, and enough sanitary police to enforce an effectual quarantine, and that all houses be guarded day and night, and that the sanitary police report to the health officer and follow out his instructions. Dr. Paul de la Barre was appointed health officer at a salary of $50 per month, and 16 sanitary policemen were selected and appointed at $1.50 per day, to do duty as guards and enforce the rules of the board of health. It is proposed to follow the instructions recommended by the State Board of Health as to disinfection and quarantine.

The board of health purchased a formaldehyd generator for disinfecting houses where there had been cases of diphtheria. There is no doubt but the epidemic of diphtheria in Port Clinton will soon be stamped out, for the board of health and health officer, as well as the citizens, are very much in earnest and they are on the right plan to deal with it effectually.

It is not known where the first case was introduced into the village, nor the origin of it. I learned that there had been a great many cases of "sore throat" prior to the epidemic of diphtheria, and I have no doubt that most of these cases were mild cases of diphtheria.

Yours truly,

(Signed) R. D. KAHLE.

PRELIMINARY REPORT ON AN OUTBREAK OF TYPHOID FEVER AT THE INSTITUTION FOR THE EDUCATION OF THE BLIND.

To the State Board of Health:

GENTLEMEN: The following communication was received from Dr. L. M. Early, Physician to the Institution for the Education of the Blind:

COLUMBUS, OHIO, June 18, 1898.

C. O. Probst, M. D., Secretary State Board of Health:

DEAR SIR: On the 29th day of May, 1898, one of the pupils at the Ohio Institution for the Education of the Blind was taken ill with typhoid fever.

June 1, a teacher, Miss Bauman, and the laundryman, Elmer Fetters, contracted the disease.

As our school closed on June 15, and fearful that there might be an epidemic, I ordered all pupils that complained of *malaise* or those having a slight elevation of temperature, to be sent to their homes. We have heard from 10 of these and the physicians in attendance pronounced their disease to be typhoid. The following is a list of the pupils, employes and teachers that are now sick, with date of illness:

Name.	Residence.	Institution.	Sent home.
Pupils.			
Frank Mominee	Toledo	May 29	
Ella Feidler	N. Madison	June 2	
John Hawkins	Youngstown	" 5	
Purley Breckinridge	Toledo		June 6.
Mina Trop	Marysville		" 8.
Sadie Harcourt	Dayton		" 9.
Blanch Clevinger	Gomer		" 10.
Fred Frye	Columbus		" 10.
Alice Swearingen	Cleveland		" 10.
Mary Kelly	Rochester, N. Y.	Removed to St. Francis Hospital	" 15.
Madge Davis	Caldwell		" 14.
Employes.			
Elmer Fetters	Columbus		June 1.
Lizzie Decker	Miamisburg		" 3.
Nannie Evans	Delaware		" 4.
Mrs. Null	"		" 13.
Teacher.			
Miss Bauman	Wooster		June 1.

Total, 16 cases.

There are four or five pupils not heard from and a few of the employes complaining.

Two years ago we had an epidemic in the institution, 15 cases, in which the cause was traced to milk infection. So far I have been unable to locate the cause in the present instance, and would most respectfully request your Board to investigate. I shall be pleased to assist you in any way that you suggest.

Very respectfully,

(Signed) L. M. Early, M. D.

On June 21, the undersigned visited the institution and examined its sanitary arrangement.

The basement is dark and unpaved, but was dry. The cold storage room was not as clean as could be desired. There was no direct sewer connection for waste water, and no opportunity for specific contamination of the food, except by flies or contaminated fingers. Those having charge of this room did not come in contact with the sick.

The worst feature about the building is the plumbing. This is old, worn and improperly constructed, and probably leaks sewer air into the sleeping and living rooms at many places. The water is from a well 70 feet deep, in gravel, overlaid by clay and hard-pan, located on the grounds of the institution, seven to eight hundred feet from any known source of pollution. It was examined by Prof. N. W. Lord, February 1, 1897, and pronounced a good water.

The same month, on the 10th, the water supply of the institution to be obtained from this well, was approved by the Board. Samples of the water were examined on July 6 and 25, August 4, 18, and October 7. The bacteria per c. c. were July 6, 16; July 25, 37, and October 7, only 5.

July 6, a sample was taken from an unused bath-room, where the water had been standing in the pipes for sometime. A suspicious organism was found in this sample, but on further study it proved to be an ordinary water bacterium.

The chemical examinations showed a considerable change had taken place in the water between February, 1897, when Professor Lord examined it, and August, 1898, when it was examined by Mr. Horton. The rise in chlorine and nitrates leads to a suspicion that the well had received surface water.

The question of an infected milk supply being the cause of the trouble was considered, but no information of importance could be obtained.

The following letter in regard to the plumbing of the institution was sent to the Board of Trustees:

COLUMBUS, September 12, 1898.

To the Board of Trustees, Institution for Blind, Columbus, Ohio:

DEAR SIRS: At the request of your attending physician, Dr. L. M. Early, a committee of the State Board of Health is making an investigation of the cause of typhoid fever which lately developed among the employes and pupils of your institution, and the President and Secretary of this Board recently inspected the sanitary condition of the institution.

We are not yet able to report upon the cause of the typhoid fever, but considering the changes and additions being made to the institution at this time, we have thought it desirable now to call attention to the need for improvements in plumbing. A number of the plumbing fixtures are old and worn, and of a pattern forbidden to be put in buildings under plumbing regulations of to-day. While not alleging that the defects in plumbing have a causal relation to the development of typhoid fever, it may be said that such a condition of the plumbing is undoubtedly a constant menace to all the inmates of the institution.

We respectfully recommend to your board that necessary changes and improvements in the plumbing should be made at the earliest possible time.

Very respectfully,

C. O. PROBST,
Secretary.

A short time after sending this letter the Board of Trustees called at the office, and the Secretary went with them before the Auditor of State and made a statement regarding the need for changes in the plumbing. The Auditor authorized the use of a part of the money appropriated for certain additions and changes in making repairs in the plumbing.

Another case of typhoid fever has developed since the school opened this year, and the investigation will be continued. The committee would be glad to receive suggestions.

(Signed)
THOMAS C. HOOVER,
C. O. PROBST,

INVESTIGATION OF TYPHOID FEVER AT SALEM.

To the State Board of Health:

GENTLEMEN: I have the honor to report that in fulfillment of an appointment by the President, I visited Salem on November 6, to make some investigations to determine, if possible, the cause of the continued prevalence of typhoid fever in that city.

I must express my appreciation of the hearty assistance and coöperation of the mayor, Mr. Fountain, and the health officer, Dr. F. T. Miles, who accompanied me on my inspections.

The records of the health officer show that since the summer of 1890 Salem has maintained a bad pre-eminence as a typhoid center. In 1890, there were reported to the health officer 64 cases of typhoid fever; in 1891, 59 cases; in 1892, 38 cases; in 1893, 111 cases; in 1894, 103 cases; in 1895, 30 cases; in 1896, 19 cases, and to November 6, 1897, 58 cases; a total of 482 cases in eight years. I have not at hand the reports of the mortality for 1896 or 1897, but for the six years, from 1890 to 1895, inclusive, there were 48 deaths from the disease. As Salem had at the last census a population of 7,720, this represents an average annual death rate of more than 103 per 100,000 of population, a number that indicates some serious sanitary neglect, for, with the exception of smallpox, typhoid fever is the most easily preventable of all diseases.

The disease has not been confined to any one part of the city. The records show that in the last four years there have been in the First ward, 51 cases; in the Second, 27 cases; in the Third, 58 cases; and in the Fourth, 66 cases. It is evident that there has been some widespread cause, the origin of which is not known. It cannot be traced to infection from without, but is in all probability due to the infectious material having retained its power of communicating the disease from some previous year, as typhoid fever seems to have been prevalent for a number of years. That the means of transportation is an impure water supply, I think there can be no doubt..

The source of Salem's supply, is ground water, coming partly from wells and mostly from the Water Company's supply, which is derived from several different sources. As the city is one of the oldest settlements in the State, is closely built upon a clay soil, is liberally supplied with privies with or without vaults, and is but poorly sewered, the opportunities for soil contamination are so great that the shallow wells (mostly from 12 to 15 feet deep, few being over 20) yield a water wholly unfit for any kind of domestic use. That such is the case, it needs no chemical or bacteriological examination to demonstrate. The naked eye revealed countless organisms in the water from all the wells that I examined, and these numbered nearly a dozen in the south, west and north parts of the city. From two of the wells samples were taken for chemical analysis, and from three others for bacteriological examination to determine the presence or absence of fecal bacteria. The bacteriologist's report shows the presence in all of the samples of an organism "similar in appearance and behavior to, if not identical with, the typhoid bacillus," while the chemist classes both of the samples of well water analyzed by him as totally unfit for use.

In regard to the public supply I may say that such frequent reports upon the sources and condition of Salem's public supply have been made by committees of the State Board of Health that mine must be largely a repetition of the findings of those committees, for I regret to say that but little improvement has been made in the quantity or quality of the supply. The sources are nearly the same as reported by Secretary Probst in 1888, and by Mr. Hartzell and Secretary Probst in 1895. The quantity has been somewhat increased by three additional wells at the old Silver's spring, near the center of the city. Although these are drilled to a depth of 105 feet, there is a possibility of their contamination, for immediately after they were drilled several shallow wells in the northeast part of the city became dry, and one, at least, of those abandoned wells is now being used as a receptacle for garbage. Another source of supply added since the last report to our Board upon the public water supply of Salem, is a well near the receiving basin at the water works, drilled, I was told, to a depth of 265 feet. The water from this well has never been submitted to our Board for approval or disapproval, and is now being used without our sanction.

The Whinnery dam, which at one time furnished a part of the Water Company's supply, is still in existence. This dam was formerly fed by a large spring, known as the Rogers spring, by a few small springs and by surface drainage, but as the water from the Rogers spring is now almost wholly used by the Water Company, but little other than the surface washings of pastures, barn-yards, pig-pens and outhouses finds its way to the dam. It is claimed by the Water Company that no water from the dam is used for the public supply, but on visiting the dam I found still existing a cistern formerly used as a filter (?), and connected with it a number of pipes, the use of which was not evident. The occasional subsidence of the dam without perceptible increase in the flow below it is highly suggestive and would call for the destruction of the dam as the surest way to restore that confidence that the people of Salem ought to feel in their water supply.

A possible source of contamination is the unfavorable location and bad construction of the receiving basin at the water works. It is in a swamp in the lowest part of the city, and not far away the Green and High street sewers, both of which have water closet connections, discharge into the same swamp. Within a year there was a crack across the bottom of the basin, which would undoubtedly permit the entrance of swamp water and possibly of sewage from the sewers above named.

I was unable to learn the number of persons using water furnished by the Water Company, the number depending upon wells or the number using water from both sources, but as 1,360 house connections have been made with water mains, undoubtedly a large majority of the people use the public supply. That the cause of typhoid fever in Salem lies not wholly in the use of well water is shown by the fact that of the 58 cases of the disease reported to the health officer this year, 40 occurred in families using the public water alone and 18 in families using well water. As the number of persons using the latter is much less than the the number using the former, it can only be said that the public supply is not as bad as the water from the wells.

For purposes of investigation two samples of the Water Company's supply were taken, one at the public fountain on Broadway and one from a private hydrant on Franklin avenue; also two samples from private wells, one on Green street and one on South Howard street. Three samples were taken for bacteriological examination. The reports of the chemist and bacteriologist accompany this.

The samples were collected after several days of rain. It is to be regretted that the samples collected at Salem for chemical analysis have always been taken after copious rains or in the spring of the year when the water was probably at its best. If chemical analyses or bacteriological examinations could be made in times of prolonged drought, when the ground water is low, contamination the greatest and typhoid fever more likely to prevail, I believe the connection between contaminated water and the prevalence of that disease could be shown by these examinations as well as by statistical evidence. Unfortunately, full reliance cannot always be placed upon chemical analysis alone to determine the potability of a water, for a water containing typhoid germs might not show the presence of such an amount of dangerous elements as to excite suspicion, but the continuance of typhoid fever in a locality is evidence of the unwholesomeness of its water supply far outweighing chemical or bacteriological examinations, and with this as a guide we will see that the present sources of Salem's supply are undoubtedly exposed to contamination. Typhoid fever decreases in cities with the abandonment of well water. It would disappear entirely with the purification of the whole supply.

The lesson to be learned from this is that the use of well water, except perhaps in the higher and newer parts of the city, ought to be abandoned and the public supply improved by some effective system of filtration. That the continued prevalence of typhoid fever in Salem shows water infection, there can be no shadow of doubt, and no expense should be spared to secure freedom from this source of danger. The money outlay to accomplish this would be more than repaid in the improvement of the public health, the prolonging of life, relief from the unhappy experience of the last few years and in the feeling of comfort and confidence that accompanies a pure water supply.

I would therefore recommend that the health authorities of Salem be urged to secure the following:

First. The interdiction of the use of all well water unless the wells are very favorably located, the soil of such a character as to protect the well from privy fouling, and chemical and bacteriological examinations show the water to be above suspicion.

Second. I would recommend the destruction of the Whinnery dam and close scrutiny of the receiving basin.

Third. I would recommend the filtration of the public water supply unless a pure water can be obtained from some other source.

These objects secured, typhoid fever would soon become a rarity in Salem, a consumation devoutly to be wished.

Respectfully submitted,

(Signed) BYRON STANTON,

Committee.

REPORT OF CHEMICAL ANALYSES OF SAMPLES OF WATER FROM SALEM.

COLUMBUS, November 10, 1897.

Dr. C. O. Probst, Secretary State Board of Health:

DEAR SIR: The four waters received from Salem have been submitted to a sanitary analysis by myself, with the following results: No. 1. Fountain on Broadway. No. 2. Hydrant at Wm. Quinn's. No. 3. Wm. Williams' well, 31 W. Green street (recently cleaned). No. 4. Mr. Mack's well, 27 S. Howard street.

Parts per 100,000.	No. 1.	No. 2.	No. 3.	No. 4.
Color	None	None	None	None
Turbidity	None	None	None	Very slight
Sediment	None	None	Very slight	Very slight
Odor	None	None	Peculiar	Peculiar
Oxygen required	.084	.068	.180	.508
Free ammonia	.0026	.0006	.0056	.1232
Albuminoid ammonia	.0102	.0030	.0094	.0492
Nitrogen as nitrites	.0005	.0001	.0220	.0180
Nitrogen as nitrates	.0472	.0588	.9020	1.6800
Chlorine	.41	.12	3.99	11.15
Total solids	28.8	29 4	76.3	119.4
Temporary hardness	19.1	22.0	25.8	22.7
Permanent hardness	3.4	.7	19.3	41.3

These figures indicate that Nos. 1 and 2 are waters of very considerable purity. The high free ammonia and nitrogen as nitrites and nitrates would cause No. 3 to be regarded with much suspicion, while all the results obtained in No. 4 show it to be a water containing a very large quantity of organic impurities. No. 3 ought not to be used in spite of the fact that the well has been recently cleaned, while No. 4 contains an amount of filth that should absolutely interdict its use.

Very respectfully,

(Signed) CURTIS C. HOWARD.

REPORT OF BACTERIOLOGICAL EXAMINATION OF SAMPLES OF WATER FROM SALEM.

COLUMBUS, OHIO, November 15, 1897.

Dr. C. O. Probst, Secretary of State Board of Health:

On November 9, I received three bottles of water marked as follows:

No. 1. Well on North Howard street. Ch. Howard.

No. 2. Well at Aetna and Lundy streets.

No. 3. Well at 57 North Howard street, Salem, Ohio.

From these samples plates in agar were made, and at incubator temperature gave after two days.

No. 1. 700 colonies per c. c.

No. 2. 98 " " "

No. 3. 85 " " "

Many of these colonies showed the iridescent notched edges occurring in typhoid growths.

Three agar tubes, to which was added four drops of Parietti's fluid (carbolic acid 5 per cent., hydrochloric acid 4 per cent.), were inoculated with a few drops of the water, and in each tube, after 48 hours, several colonies developed.

Three flasks of bouillon with Parietti's fluid were also inoculated, and showed marked turbidity in 24 hours. From these further notes were made on the bacteria so obtained.

They are actively motile; stain readily by ordinary methods, but not by Gram's; show flagellae; form no indol; do not cause coagulation in milk; give gas production in glucose-agar.

From these facts, even considering the gas production, we have here an organism similar in appearance and behavior, if not identical with, the typhoid bacillus.

Respectfully,

(Signed) A. M. BLEILE.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, December 11, 1897.

Dr. F. T. Miles, Health Officer, Salem, Ohio:

DEAR DOCTOR: I enclose herewith a copy of Dr. Stanton's report and a letter to your board of health. I wish you would please present the letter and report to your board at an early date. I would suggest the advisability of having the report printed in your papers.

Yours truly,

(Signed) C. O. PROBST, M. D.,
Secretary.

REPORT OF AN INVESTIGATION OF TYPHOID FEVER AT STEINERSVILLE.

To the State Board of Health:

Gentlemen: I was called to Steinersville September 8, 1898, to investigate the cause of an outbreak of typhoid fever. This is a small village in Belmont county, numbering less than 100 souls. The disease first appeared June 23, of this year, and at the time of my visit there had been 21 cases, with one death. Seventeen of the cases developed after July 15.

An investigation of the cause of the outbreak revealed the fact that each of the patients had drunk water from one particular well. No one who had *not* used water from this well was affected. The well has an interesting history. About 45 years ago typhoid fever prevailed in this village for a short time, and the well, suspected as being the cause of the present outbreak, furnished water to those who were ill. The well was filled with stones and remained closed for about 25 or 30 years. It was then cleaned. Up to this time the well had drawn its water from the soil above a limestone rock; but when it was cleaned it was deepened a few feet, and a large vein of water was found in a break in the limestone. No typhoid fever developed among the users of this well until the present year. Last year a case of fever, not called typhoid, occurred in a house a short distance from the well, and on higher ground. The village is built on a side hill, and there are several privy vaults above the well and in a line with it, making pollution from surface wash and subsoil filtration possible.

I examined several of the cases, and from their history and appearance am of the opinion that they were undoubtedly cases of typhoid fever. Samples of blood were taken from three of the patients and submitted to the Widal test, with negative results. It is proper to say, however, that the blood was collected on soft paper, and when the specimens were received at the laboratory they were not in good condition for examination.

The suspected well was ordered closed, after samples had been collected for chemical and bacteriological examinations. The results of these examinations were as follows:

September 17, 1898.

Chemical and bacteriological. Steinersville water. Three jugs of water collected by Dr. Probst, and received September 11, 1898:

Parts per million.	John Bonar well.	Geo. A Komer well.	G. A. K., No. 2. (farm.)
Color	.0	.0	.0
Turbidity	None	None	None
Sediment	Very slight	None	None
Odor	None	None	None
Oxygen required	.912	.854	.641
Nitrogen as free ammonia	.007	.001	.001
Nitrogen as albuminoid ammonia	.036	.046	.015
Nitrogen as nitrates	9.228	18.140	10.052
Nitrogen as nitrites	Trace	Trace	Trace
Chlorine	23.75	52.78	9.32
Temporary hardness	222.4	98.6	229.8
Permanent hardness	55.6	143.0	16.0
Total solids	481.	767.	429.
Loss on ignition	105.	247.	84.
Bacteria per c. c.	238.500		

The chlorine and nitrates with the opportunity for pollution, as shown by inspection, would condemn the use of water from John Bonar and George A. Komer, No. 1 wells. Also note the bacteriological result in the John Bonar well. The farm well, George A. Komer, No. 2, is high in nitrates and fairly high in chlorine, but under favorable surroundings this water could be used.

(Signed) E. G. Horton.

This leaves but little doubt as to the well in question having been the cause of the outbreak.

Three additional cases have been reported there since my visit.

Respectfully,

C. O. Probst,
Secretary.

YELLOW FEVER IN OHIO.

On October 19, the Secretary of the State Board of Health was called to investigate a reported case of yellow fever in a family living near Newton Falls, Trumbull county, Ohio. After having examined the case he was of the opinion that it was probably yellow fever, and proper precautions were taken to prevent any spread of the disease, although the danger of such spread was not supposed to be great. The patient died the following day.

A very good description of the case and of its supposed origin was furnished by the attending physician, Dr. H. A. Fiester, to the *Medical World*, which was printed in that journal in January, 1899.

Following is the doctor's report, practically entire:

"Editor *Medical World*: I wish to describe to the readers of the *World* a case of yellow fever that recently came under my observation, that of Miss Blanche Beck, aged 28, an accomplished young lady, who graduated from Hiram College last spring, and was called to teach in the Southern Christian Institute, at Mt. Beulah, two miles from Edwards, Miss.

"She was there one week and taught but three days. Upon advice of President Lehman, the teachers were all directed to leave on account of the prevalence of yellow fever. Miss Beck told him she did not care to leave, as she was not afraid of the fever. He insisted upon them all leaving, for he said they had a serious time of it in Edwards last winter, for some of them were in quarantine nine weeks. So he thought it best for all of them to leave, as they might not be able to get out even if they should want to go at some future time. So the school was closed and the president chartered a car. There were 13 in the car. They took a train at Smith's Station above Edwards. But at Edwards five persons got on to go north too. One lady came from the sick-bed of her brother-in-law, who died two days later with yellow fever. The lady herself never got the fever. A. T. Ross, another member of their party, had the fever at Union City, Indiana.

"Mr Lehman, president of the institute, who has been through several yellow fever epidemics, and who is a close observer, feels quite sure that this lady was the source of infection for both parties. He thinks she carried it in her clothes. Miss Beck was taken sick one week after reaching her home, which is in Paris, five miles from Newton Falls. I saw her in the night on October 12, 1898, first, after having a chill (she had but one chill). Her temperature was 102° F. Her pulse did not correspond with her temperature, and was not rapid but extremely weak. Her pulse throughout the disease gave me more uneasiness than any other symptom, for it seemed impossible to arouse the sluggish circulation. Next morning her temperature was 101° F.; in the evening 102°F. On the third day there seemed to be a complete remission in the morning temperature, and hardly any rise in the afternoon temperature. She seemed to be more rested and cheerful than she had been at any time previous, but as Wood says, 'It was a delusive calm,' for next morning temperature went up again.

"Wood, Da Costa, Reynold and other good authorities say that yellow fever is a disease of a single paroxysm, which is seldom or never repeated, but further on they say the fever does not distinctly remit until after from 36 to 48 hours, when a remission occurs. Upon this remission the fate of the patient hangs, and if the fever goes up, as it did in this case, it usually tends to a fatal issue. The highest I found her temperature at any time was 104° F. The day before she died morning and evening temperatures were 96°. One peculiar feature was that when she had the remission she was about as thirsty as ever.

"Dr. Palmer, of Warren, was called in October 16, but at that time was not willing to affirm or deny that she had yellow fever. He said she had all the earmarks of yellow fever, the excruciating headache, the ache in the limbs, back and joints, which are the symptoms of yellow fever, but she did not possess that yellowness of skin and inky vomiting which are the sure signs of the fever, and besides that she had been sick nearly a week, and the authorities say this should develop in four days at the most. He said, 'I am waiting developments.'

"When Dr. Palmer saw the case she did not possess that yellowness of skin as marked as later on. The yellowness of skin was very slow in coming out. The characteristic vomiting also appeared. Her mind was clear within a few hours of her death. Miss Beck told me (she had a very good idea of yellow fever, and her statements were generally found to be correct) that they told her in the South that people of light complexion (she was unusually fair) did not always turn yellow, but that some of the cases instead of becoming yellow fairly bleached or blanched out, and that they did not always have the black vomit.

"Dr. Wood says the 'black vomit, yellowness of the skin and hemorrhage have been mentioned as attendants upon this last stage, *but patients often die without them.* The yellowness of the skin to which the disease owes its ordinary name, though a common, is by no means an invariable symptom.'

"He also says that 'in fatal cases, death takes place most frequently on the fourth, fifth or sixth day, though sometimes as early as the, third. and sometimes as late as the eleventh day.' She died on the morning of the tenth day. The suffused redness of the face was present a good deal of the time.

"I had to resort to hypodermics to keep her from vomiting, for she was unable to keep anything in her stomach most of the time. Her stomach was very sensitive to the touch. She told me if she only got a small amount up, it relieved her for a short time. At first the vomited material came up by a sort of regurgitation, then she made considerable effort to throw it off; later she could throw up mouthfuls without any effort on her part.

"She voided very little urine, and with considerable pain. She had a pointed tongue with white coating, not heavily coated at any time, with red edges. She complained of a terrible exhalation from her body. She said the people in the South complained of what they called a 'terrible odor.' I must confess that I never noticed any odor like that before. I cannot describe it. It was a peculiar odor. Her breath was also very offensive.

"Bowels were very much constipated, except at the fatal issue, when they run off. She had a rash after she came home. It lasted but a short time. I did not see it. Authorities speak of some of the cases having a rash early in the disease, before the febrile symptoms develop, which is very uncommon in other febrile diseases. Her eyes were very much suffused, and had yellow conjunctivas from the first.

"When Dr. Probst, Secretary of the State Board of Health, saw the case on October 19, she was yellow as an orange. He was of the opinion it was yellow fever, and reported the same to the Board.

"Upon watching the case closely, I am firmly convinced that it was a genuine case of yellow fever. Would like to have the opinion of the readers of the *World*, especially those of the South who have had experiences in yellow fever, and also their opinion whether the contagion can be carried in the clothes in the South."

H. A. Fiester, M. D.

Newton Falls, Ohio.

PUBLIC WATER SUPPLIES.

REPORT ON WATER SUPPLY FOR BLANCHESTER.

To the State Board of Health:

GENTLEMEN: The mayor of Blanchester has made application for the approval of a new source of a public water supply for that village. I visited Blanchester, by request of the council, in November, 1896. They had at that time nearly finished a well located at the edge of the village. In sinking this well, and near its bottom, they found leaves, twigs and branches of trees of considerable size. I advised against the location of the well, and the analysis of a sample of the water showed it to be not of good quality. I notified the engineer, Mr. McKibben, of this fact, and the understanding was that another location would be selected for a well. In spite of this, however, a pumping station was erected and the well put in use. It proved to be a failure, furnishing but a small amount of water.

By request of the council I again visited Blanchester on November 10, 1897, and carefully looked over the ground. From the best information to be obtained there seemed to be no good prospect of obtaining a sufficient quantity of ground water of good quality. I was shown the place where it is proposed to impound the waters of a small creek and store sufficient water for public use,—about 11,000,000 gallons. The reservoir will cover an area of about four acres, and when full the water will be four feet deep at the shallowest place (along the edge,) 10.76 feet deep at the deepest place, with an average depth of nearly eight feet. The water shed contains about 1,500 acres with only four residences on it. Arrangements will be made to prevent pollution of the water from this source.

The proposed reservoir will be about 1,500 feet east of the village and about 1,400 feet southeast of the present pump house, to which water can be carried by gravity. The bottom of the reservoir will be about six feet higher than the highest point in the village. A plan of the reservoir has been filed.

I respectfully recommend that the plans for a water supply for the village of Blanchester be approved.

Respectfully,

C. O. PROBST,

Secretary.

Ohio State Board of Health,
Office of the Secretary,
Columbus, May 23, 1898.

Mr. John W. Foote, Mayor, Blanchester, Ohio:

Dear Sir: The State Board of Health has considered your application for approval of a new source of public water supply to be obtained by establishing an impounding reservoir about fifteen hundred feet east of the village and according to plans submitted by you, and you are hereby notified that the said source of supply has been approved by the Board.

Yours truly,
C. O. Probst,
Secretary.

By order of the Board.

REPORT ON PROPOSED WATER SUPPLY FOR BLOOMVILLE.

To the State Board of Health:

Gentlemen: The council of Bloomville, Seneca county, having made application for approval of a new water supply, I visited that place March 26, 1898.

Bloomville is a village of about 900 inhabitants. An electric light company furnishes light for the village, and has established a power plant near the center of the town. The council has had a well drilled in the boiler room of the lighting plant, and is expecting the electric light company to furnish power for the water works plant. The well is 145 feet deep, in limestone with 30 feet of covering, mostly yellow clay. There are a number, probably a dozen or more, privies within a hundred feet of the well. So far as I could learn none of these has a vault. A few are provided with boxes above ground. A storm water sewer passes within 30 to 40 feet of the well, and empties into an old abandoned cistern, from which the water overflows into another sewer.

The surroundings of the well are certainly bad; and the water being found in lime rock, the well would be subject to contaminating influences at a considerable distance, its only protection being the clay cover over the rock. This clay is of an impervious character, as uncemented cisterns are used in some parts of the village. The town cannot afford to spend much money for water works, and to require them to locate the wells at some other place and erect a pumping station may defeat the water works project. I am of the opinion, however, for reasons stated above, that the proposed source of supply should be condemned, and respectfully recommend that this be done. The following report of the chemist supports this conclusion:

COLUMBUS, OHIO, April 8, 1898.

Dr. C. O. Probst, Secretary State Board of Health, City:

DEAR SIR: Following is the analysis of the sample of water sent me and marked Bloomville, Ohio:

PARTS PER 100,000.

Free ammonia	0.0010
Albuminoid ammonia	0.0068
Nitrogen as nitrites	0.0009
" " nitrates	0.033
Chlorine	3.80
Oxygen required	0.11
Temporary hardness	42.6
Permanent "	32.6
Total solids	110.0
Volatile solids	17.0

The water is very low with ammonias and oxygen but the presence of *nitrites* and *high chlorine* is suspicious. The nitrites may come from reduction of nitrates but the reduction is slight as is shown by the absence of more than traces of free ammonia. Unless there is reason to suspect *mineral chlorine*, I would investigate the surroundings carefully before passing the water as safe.

Yours very respectfully,

(Signed) N. W. LORD.

In regard to the high chlorine spoken of I wrote to the health officer, Dr. Loose, in regard to it, and he replied, " I have been unable to find any salt wells in the vicinity."

Respectfully submitted,

C. O. PROBST,

Secretary.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, May 23, 1898.

Dr. T. C. Loose, Health Officer, Bloomville, Ohio:

DEAR DOCTOR: The State Board of Health condemned the proposed water supply for your village, believing it would not afford a safe supply. It will be necessary for your council to locate a well at some other point where conditions are more favorable for a purer supply of water.

Yours truly,

(Signed) C. O. PROBST, M. D.,

By order of the Board. *Secretary.*

REPORT ON WATER SUPPLY FOR CALDWELL.

GENTLEMEN: On October 22, 1897, I visited Caldwell, Noble county, for the purpose of investigating the water supply proposed for public water works.

The town has about fifteen hundred inhabitants and is located at the confluence of Duck and Salt creeks. At the time of my visit, there was no living water in either of these streams. Duck creek drains a much greater area, but its valley is said to be dry unless at a very great depth.

The territory where the wells are being put down is east of the town, and without the corporate limits, and in the Salt creek valley. Here six wells had been drilled. Tracings of these, I am informed by Mr. Chapin, the engineer, have been furnished the members, therefore, that information can be omitted by me.

Two of these wells just south of the creek and at the foot of a lofty ridge of hills, are dry holes. Another well is within 100 feet of an old salt well, which was located in the creek, and was worked about 30 years ago. This salt well is said to have been 400 feet deep and very productive. There is now no trace of the well. The water from well No. 4, located within 100 feet of the salt well, is very salty, and will, of course, not be used.

It is claimed that the salt deposits about the old salt well are accountable for the salty waters in this well, as it is claimed the salt bearing strata are not to be found short of 100 feet.

Two other wells more remote from the old salt well produce apparently good water, and from one of these, No. 2, the sample for analysis was procured. Well No. 6, being drilled while I was there, I learned from Mr. Chapin, is by far the best yet put down, as to quantity, producing 1,500 gallons per hour.

As the hill some hundred feet north of the creek is approached, a better and more abundant water is found. In this locality, other wells will be drilled.

In Salt Creek valley, several old oil wells are located, oil having been found here 60 years ago. Most of these wells are abandoned. There is one well several hundred feet south of the site of the wells from which a thick lubricating oil is bailed. This oil well is in the west end of the very old town of Olive, a place of about 150 inhabitants. On the hill north of the wells, but several hundred feet away, is a sparsely populated cemetery which, I think, need cause no apprehension.

If the chemical analysis of the water is satisfactory, I recommend the approval of this proposed water supply.

Respectfully,

J. C. CROSSLAND.
Committee.

FURTHER REPORT UPON THE WATER SUPPLY OF CALDWELL.

A sample of water from well No. 6, collected by C. O. Dye, mayor of Caldwell, was examined. The chemist reported upon this water and upon water from well No. 2, as follows:

COLUMBUS, OHIO, November 5, 1897.

DR. C. O. PROBST, Secretary of State Board of Health:

DEAR SIR: The two samples of water from Caldwell have been submitted to a sanitary analysis with the following results:

Parts per 100,000.	Well No. 6.	Well No. 2.
Color	.2	.0
Turbidity	slight	none
Sediment	considerable, dark	slight
Odor	slight	none
Oxygen required	2.40	.12
Free ammonia	.0106	.0018
Albuminoid ammonia	.0394	.0056
Nitrogen as nitrites	none	none
" nitrates	trace	trace
Chlorine	83 78	25 91
Total solids	194.7	74 4
Temporary hardness	24.2	26 6
Permanent "	trace	trace

The sample from well No. 6, when separated from the dark sediment by filtration contained oxygen required .60, free ammonia .0036, albuminoid ammonia .0244, from which it is seen that a considerable part of the organic matter is in suspension and not in solution. A favorable opinion cannot be entertained, even of this. Both are salt waters, containing an amount of salt that will doubtless render their use objectionable.

Yours respectfully,

(Signed) CURTIS C. HOWARD.

A copy of this report was sent to Mr. Chapin, the consulting engineer, he stated that the sample from well No. 6 had not been properly collected and did not represent the real product of the well. He urged another investigation to be made.

The undersigned visited Caldwell, November 15. Well No. 6 was being pumped by a steam pump, and had for sometime previously. A rough measurement showed that about 1,500 gallons of water per hour were being pumped. Two additional wells had been drilled in the same field. The geological formation in No. 7 was given as follows:

Strong vein of surface water from 11 to 15 feet,

15 to 20 feet yellow, tough clay,

20 feet bastard limestone,

Casing 20 feet, 6 inches long, set on bastard limestone at 23 feet, 6 inches, vein of water from the south,

23 feet, 6 inches to 25 feet yellow mud or clay,

25 to 27 feet blue fire clay,

27 to 37 sandy shale,

37 to 38 blue fire clay,

38 to 41 very hard sandy shale,

41 to 42 blue fire clay,

42 to 48 blue sand rock,

48 to 51 feet, 6 inches coal,

51 feet 8 inches to 54, fine blue gravel,

54 to 60 feet blue mud or fire clay.

Samples of water were collected from wells Nos. 1, 4, 6 and 7, and submitted for analysis.

The chemist reports as follows:

COLUMBUS, November 18, 1897.

DR. C. O. PROBST, Secretary of State Board of Health:

DEAR SIR: The four samples of water from Caldwell have been submitted to a sanitary analysis by myself with the following results:

PARTS PER 100,000.

	Well No. 1.	Well No. 4.	Well No. 6.	Well No. 7.
Color	.0	.0	.0	.0
Turbidity	slight	slight	slight	slight
Sediment	very heavy	very heavy	slight	very heavy
Odor	putrefactive	musty	musty	musty
Oxygen required	.190	.352	.140	.324
Free ammonia	.0104	.0642	.0656	.0124
Albuminoid ammonia	.0088	.0152	.0034	.0132
Nitrogen as nitrites	.0005	.0003	.0001	.0150
„ nitrates	trace	trace	trace	trace
Chlorine	1.35	127.8	178.63	23.96
Total solids	40.7	250.6	176.0	116.6
Temporary hardness	30.8	26.0	27.6	37.9
Permanent "	trace	trace	trace	12.7
Chlorine as salt, grains per gallon	1.29	122.68	75.48	25.00

None of these waters can be regarded as fit for domestic use. The enormous quantity of chlorides in No. 4 and No. 6 would alone make them objectionable without reference to the large amount of decomposing organic matter. In reporting chlorine as common salt, it is not intended to assert that a part of the chlorine may not be present as calcium or magnesium chlorides. The physical properties of No. 1 prove its fitness for household use. The high ammonias and nitrites in No. 7 equally demonstrate its want of organic purity.

Yours respectfully,

(Signed) CURTIS C. HOWARD.

In view of the unsatisfactory quality of this proposed water supply as shown by chemical examinations, we respectfully recommend that it be disapproved.

We made a partial examination of Duck creek valley, and would recommend that a search for ground water be made there, as the conditions seems to be more favorable for obtaining a suitable water supply than in Salt run valley.

A blue print map of the village of Caldwell, and one showing the geology of six of the wells, are appended hereto and made a part of this report.

Respectfully,
J. C. Crossland,
C. O. Probst,
Committee.

FURTHER REPORT ON THE WATER SUPPLY FOR CALDWELL.

On the 22d of December, I was again requested to visit Caldwell for the purpose of investigating a proposed water supply. I found that a well had been put down in the Duck creek valley above the town, in the locality where I had suggested that a search for water be made, to the depth of 75 feet. This well produced a large quantity of water which was very salty to the taste. The well was therefore abandoned. Several hundred feet from this well, a shaft about five feet square was put down to the depth of 20 feet. This gave a good supply of water, the quantity, I do not just now remember. The soil through which the shaft was sunk consisted of about 15 feet of surface clay, at which point a gravel bed was found, and in this gravel bed the supply of water. This shaft, I may say, was sunk at a distance of 150 feet from Duck creek, at a point where the channel is pretty deep, and contains a pretty good volume of water. From this shaft a sample was secured, and submitted to the chemist for analysis, whose report is appended hereto.

It is proposed by the authorities to put down two or more shafts in this locality at a distance of 100 to 200 feet from Duck creek to a distance of 20 feet, which shafts are to be about 15 feet in diameter. It is proposed to make these shafts water-tight by a wall down to the gravel bed. Judging from the capacity of the shafts already put down, two or three will be sufficient to give an amply supply. The supply is absolutely free from any possible source of contamination, with the exception that the shafts are located on ground that sometimes overflows. To afford protection against contamination in this way, it is proposed to build a protection wall some four or five feet above the ground, which will be above the highest known water mark. From this supply the water will be pumped to a very lofty point on a bluff very nearby to a reservoir from which it will be distributed to the city. The reservoir is located sufficiently high to give amply gravity pressure for all purposes. This is undoubtedly the best water available for the people of Caldwell, and its approval is recommended.

J. C. CROSSLAND.
Committee.

COLUMBUS, OHIO, December 31, 1897.

Dr. C. O. Probst, Secretary:

MY DEAR SIR: Following are results of analysis of sample of water sent me December 28, and marked "Caldwell, O."

Water containing considerable sediment but showing no turbidity on standing. Very slightly earthy odor.

PARTS PER 100,000.

Free ammonia	.0028
Albuminoid ammonia	.0120
Nitrogen as nitrates	trace.
" nitrites	.0011
Chlorine	0.10
Oxygen required—	
for turbid water	0.44
" clear "	0.17
Temporary hardness	19.8
Permanent "	0.4
Total solids	23.5
Loss on ignition	3.7

This sample of water shows evidence of the presence of organic matter, probably of vegetable origin, and existing largely as a light sediment. The low chlorine and ammonias show little evidence of sewage pollution. I think there is nothing in this analysis to show the sample unsafe, except that it is apparently of surface or shallow well origin, and therefore wholly unprotected from slight accidental pollution, the danger from which must be judged by the surroundings of this source and which, if present, would condemn this water.

Respectfully,

(Signed) N. W. LORD.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, January 11, 1898.

Mr. L. E. Chapin, Consulting Engineer, Defiance, Ohio:

SIR: The State Board of Health has considered your application for approval of plans for a public water supply for the village of Caldwell, to be obtained from gravel in Duck creek valley by means of shafts. You are hereby notified that said water supply has been approved.

Respectfully,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON PROPOSED WATER SUPPLY FOR CHICAGO.

To the State Board of Health:

GENTLEMEN: The village of Chicago made application for approval of the source of a proposed public water supply, and I visited that place May 21, 1898.

Chicago is a village of about 2,300 inhabitants, located on the Baltimore and Ohio railroad, in Huron county.

Two six-inch test wells were put down to a depth of 69 feet, which produced flowing water. The earth strata encountered, according to the driller's report, were as follows:

Blue clay	14	feet.
Quick sand	15	"
Clay mixed with some sand	20	"
Gravel to the depth of	20	"

The gravel deposit is considerably deeper than this. Water was found in the gravel just under the clay, and rises to the surface of the ground. The wells are located at the edge of the village near the track of the Baltimore and Ohio railroad. There is one dwelling house near the wells, but it is proposed to purchase the land on which this house is located, and to remove it. A receiving well is to be constructed near the flowing wells, and the water collected in the receiving well is to be pumped to a stand-pipe for distribution. There are a number of flowing wells in the neighborhood of the test well, yielding considerable water. The test wells each showed a yield of about 86,000 gallons per day. Pumping one well did not lower the other one, although they were not more than 30 feet apart.

A sample of the water was collected and submitted to Professor Lord for examination, who reported as follows:

COLUMBUS, OHIO, June 28, 1898.

Dr. C. O. Probst, Secretary of the State Board of Health, City:

MY DEAR SIR: Following are results of analysis of the sample of water sent me and marked "Chicago, O."

Water clear and no sediment, has a slight odor of sulphureted hydrogen.

PARTS PER 100,000.

Oxygen required	0.18
Free ammonia	.0652
Albuminoid ammonia	.0060
Nitrogen as nitrites	very faint trace
" nitrates	none
Chlorine	0.88
Temporary hardness	31.6
Permanent "	none
Total solids	45.5
Volatile solids	7.5

Water contains alkaline carbonates.

This water is very high in free ammonia but is low in other organic ingredients. I understand that this water is from a "deep well." This would satisfactorily explain the high free ammonia, and I should consider this water as pure in the sanitary sense of showing no evidence of sewage contamination of a recent character.

Very respectfully,

(Signed) N. W. LORD.

The water appears to be of excellent quality, and with proper care should easily be kept so.

I respectfully recommend that the proposed water supply for Chicago be approved, subject to the following conditions:

1. That at least two acres of land surrounding the wells be acquired for water works purposes.
2. That the dwelling house on this land be removed.
3. That the receiving basin be made safe against the entrance of ground water.

Respectfully submitted,

C. O. PROBST,

Secretary.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, July 5, 1898.

To the Mayor and Council, Chicago, Ohio:

DEAR SIRS: The State Board of Health has considered your application for the approval of a public water supply for your village, to be obtained from drilled wells located at the edge of the village, near the B. & O. Railroad Company's track.

You are hereby notified that the proposed supply has been approved, subject to the following conditions:

1. That at least two acres of land surrounding the wells be acquired for water works purposes.
2. That the dwelling house on this land be removed.
3. That the receiving basin be made safe against the entrance of ground water.

Yours truly,

(Signed) C. O. PROBST,

By order of the Board. *Secretary.*

REPORT ON THE PROPOSED WATER SUPPLY FOR CINCINNATI.

To the State Board of Health :

Gentlemen : Application for approval of the proposed water supply for Cincinnati having been made by Mr. G. Bouscaren, chief engineer, the undersigned committee, on November 11, 1897, inspected the plans and source of the proposed supply in company with Mr. Bouscaren.

The following description and plan of improvements proposed for the Cincinnati water works have been furnished by the engineer:

The proposed improvements will consist of an intake pier in the Ohio river, above the city ; of an aqueduct tunnel under the river, connecting the intake pier with the pump-pit of a first pumping station that will elevate the water from the river to a system of settling basins ; of a filtering plant that will receive the water from the settling basins and deliver it in a purified condition into a clear well or reservoir ; of a gravity conduit that will convey the filtered water from the clear well to a second pumping station in the city ; and finally, of one or more lines of pump mains connecting said pumping station with the Eden Park reservoir and with the distributing mains of the city.

The intake pier is located in the channel of the river, near the Kentucky shore, opposite the village of California, above the mouth of the Miami river, about six and one-half miles above the present pumping station. At said location, which was approved by the Secretary of War September 24, 1897, the water is 20 feet deep at the lowest stage. The pier will be carried to an elevation five feet above the highest flood level. It will have an inlet chamber connecting with the river and an outlet chamber connecting with the aqueduct tunnel by a shaft seven feet in diameter.

Two sets of gate openings in the inner chamber will allow the water to be taken at different elevations. The water will be screened in its passage from the inlet to the outlet chamber by movable wire screen frames, provision being made to keep them clean.

The aqueduct tunnel will be built in the rock formation under the river. It will be lined with brick and concrete, and will be seven feet in diameter.

The bottom of the pump pit in the first pumping station will be 10 feet below low water. There will be three pumping engines of 30 million gallons capacity each in 24 hours, with room for a fourth engine of the same capacity.

The water will be conveyed from the pumping station to the settling basins by two lines of force mains five feet in diameter.

There will be two settling basins of an aggregate capacity of about 350,000,000 gallons, the depth of water varying from 30 to 50 feet. The two basins will be used alternately for receiving and delivering. Provision will be made in both of them for drawing the water supplied to the filters at any desirable depth below the surface by a system of floating tubes. The period of subsidence in these basins will be from three to four and one-half days, as the rate of consumption varies from 40,000,000 to 60,000,000 gallons per day. Room is provided for additional basins of about 320,000,000 gallons capacity, to be built as required, when the daily consumption exceeds 60,000,000 gallons. Provision will be made to clean the settling basins by flushing at regular intervals of time.

The water will flow by gravity from the settling basins to filter beds or mechanical filter tanks, as may be found best from results of experiments to be conducted for a period of nine or ten months, to determine the adaptability of sand filtration to the complete purification of Ohio river water under the varying conditions of the seasons.

The experimental station is now being constructed for a capacity of 100,000 gallons per day.

The filtered water will be discharged into a covered clear well, which will act as a regulating reservoir between the uniform output of the filters and the irregular demand of the consumption.

The settling basins, the filter plant, and the clear well will all be located on the high ground between the village of California and the Miami river.

The gravity conduit between the clear well and the second pumping station will be approximately four and one-half miles long. It will be seven feet in diameter, and is intended for a maximum delivery of 120 million gallons in 24 hours.

The second pumping station will be located at Pendleton, between Eastern avenue and the river bank. There will be four pumping engines of 20,000,000 gallons capacity each in 24 hours, with room for two additional engines of the same capacity. These pumps will receive the filtered water from the gravity conduit, and deliver it into Eden Park reservoir or directly into the distributing mains.

Your committee respectfully recommends that the proposed supply be approved, subject to the condition that the water shall be filtered in a manner satisfactory to the State Board of Health.

Respectfully,

THOMAS C. HOOVER,
BYRON STANTON,
C. O. PROBST,
Committee.

Ohio State Board of Health,
Office of the Secretay,
Columbus, January 24, 1898.

Mr. G. Bouscaren, Chief Engineer, Cincinnati, Ohio:

Sir: The State Board of Health has considered your application for approval of improvements proposed for the water works of the city of Cincinnati, as shown by plans and specifications submitted by you, and you are hereby notified that said plans have been approved, subject to the condition that the new water supply shall be filtered in a manner satisfactory to the State Board of Health.

Yours truly,
(Signed) C. O. Probst,
By order of the Board. *Secretary.*

REPORT ON PROPOSED CHANGES AND EXTENSIONS OF THE COLUMBUS WATER SUPPLY.

To the State Board of Health:

Gentlemen: Your committee appointed to consider and report upon certain changes and extensions of the water supply of Columbus, respectfully report as follows:

The nature of these proposed changes which the State Board of Health has been asked to approve, are sufficiently well set forth in the following communications from the Director of Public Improvements of the city of Columbus:

Columbus, Ohio, April 20, 1898.

Hon. Thos. C. Hoover, President State Board of Health, Columbus, Ohio:

Dear Sir: I herewith submit to your Honorable Board plans for a storage dam in the Scioto river, to store an additional supply of water to be used during periods of extreme droughts, when the flow of the river and the storage dam now in use by the city are insufficient to supply the water needed.

The site selected for the proposed dam is about five and one-third miles above the West Side pumping station, and midway between the Jones and Fishinger dams, the latter now owned and used by the city as a storage dam for the West Side pumping station.

Numerous soundings and measurements made during the last season extending from the West Side pumping station to about three miles north of the Franklin county line, a distance of about 18 miles, resulted in the selection of the proposed site as the most suitable one for a storage dam for a water supply, cost of construction, quantity of water stored, present and future uses, considered.

While the building of this dam is not considered an extension or even a change of the present public water supply, yet the future uses to which this dam may be put, may be of sufficient importance to justify a careful examination of the structure as designed. The valley immediately below the proposed dam, on both sides of the river, is well suited to locate settling basins and filtering beds near the reservoir which, no doubt, will be done at some time in the future when the conduit system now in use will be endangered by the growth of the city in that direction. At such time the pumps should be located at the dam and the water pumped from the filtering beds through mains directly east to North Columbus, the highest elevation in the city, and there connect with the city's mains.

The pumps can be operated with water power from six to eight months during the year, and coal delivered directly to the pump house by extending the siding from the quarries at Jones' dam.

Respectfully,

(Signed) FELIX A. JACOBS,
Director of Public Improvements.

COLUMBUS, OHIO, April 20, 1898.

To the Honorable State Board of Health :

GENTLEMEN : I herewith hand you plans for the proposed extension of the conduit to increase the supply of underground water at the West Side pumping station.

During the season of 1897 about 9,000,000 gallons of water were pumped at this station every 24 hours. Of this amount, about 7,000,000 gallons were derived from the conduit as underground water, and about 2,000,000 gallons were taken direct from the river.

With a view of increasing the underground supply sufficiently, so as not to take any water direct from the river, a number of wells were sunk to ascertain the underground sources of water. These wells developed the limestone rock to be at various depths from seven feet below low water at a point 2,400 above the Grand View avenue bridge, to 64 feet at the south branch of the conduit a short distance above the C., C., C. & St. L. Railway bridge. Good water bearing gravel, from 10 to 21 feet in depth below low water, was found to extend from the south branch of the conduit to a short distance above the Grand View avenue bridge, a distance of about 8,000 feet. We at once commenced to extend the conduit, with a 42-inch perforated iron pipe, in place of brick used in the old conduit. About 400 feet was laid during the dry season of 1897. With this conduit extended, the supply of underground water will be sufficient, without resorting to the river direct. Small dams, from one to two feet in height, located at suitable intervals across the river will allow the water to penetrate into the gravel beneath.

Yours respectfully,

(Signed) FELIX A. JACOBS,
Director of Public Improvements.

Your committee, after a careful consideration of the plans, called to its assistance as consulting engineer, Mr. Allen Hazen, of New York, whose report will be found under Exhibit A, attached hereto.

The quality of water furnished by the present gallery system was studied by the aid of chemical and bacteriological examinations, as set forth in Exhibit B.

The source of supply of the gallery system was studied by means of a series of observation wells, which work was kindly undertaken by Mr. Julian Griggs, city engineer of Columbus. The results of these observations are shown in Exhibit C.

Your committee is of the opinion that the Scioto river affords the best available source for a permanent water supply for the city of Columbus. The supply must be stored during the dry seasons. The proposed dam is apparently the most practical way of accomplishing this. The location of the proposed dam, in our judgment, is the best that could be selected, all things considered.

The use of water so stored should not be permitted without adequate purification by some approved system of filtration. We are fully in accord with the recommendation of Mr. Hazen that the river water should not only be purified, but should be softened, and we think it could easily be shown that the expense of so doing would be more than returned to the taxpayers by savings in various directions, sure to follow.

Your committee only incidentally considered the question of the quantity of water to be stored by the proposed dam. The available storage will be about one billion gallons, or at the present consumption, a supply for a little over two months, should all the water be taken from the river. It seems probable that the continued growth of the city may more than double present consumption, and we second the recommendation of Mr. Hazen that the question of increasing the height of the proposed dam should be given further consideration by the city.

The committee does not consider that the plans for the construction of the dam should be acted upon by this Board. No consideration was given to the question as to whether the proposed dam will successfully store impounded waters.

We respectfully recommend that the plans for the proposed dam for the city of Columbus be approved, subject to the following conditions:

(*a*) That the ground to be flooded by water be stripped of vegetation and upper layers of soil (earth).

(*b*) That completed plans for purifying the stored water in a satisfactory manner be submitted to this Board within a reasonable time.

The committee does not view with much favor the proposed extension of the filter galleries. It may be wise that a new iron conduit should replace the old one of brick if, as we were informed, there is danger of the brick conduit caving in and shutting off this source of supply. The extension of the gallery into new territory for the purpose of securing badly needed additional supplies is a questionable proceeding. It is questionable, however, from an economic rather than from a sanitary standpoint, as there is reason to believe that whatever water is so obtained will be of fair quality and not liable, under present conditions, to convey disease; and as this is simply a question of policy, which should be decided by the city authorities, we respectfully recommend that the plans for the proposed changes and extensions of the filter gallery system of water supply of the city of Columbus, as submitted to this Board, be approved, provided that from and after the completion of such changes and extensions of the gallery system no water taken direct from the Scioto river or Olentangy river shall be supplied to said city.

Respectfully submitted,

JOSIAH HARTZELL,
THOS. C. HOOVER,
C. O. PROBST,
Committee.

EXHIBIT A.

REPORT OF MR. ALLEN HAZEN, C. E., ON PROPOSED CHANGES IN THE WATER SUPPLY OF COLUMBUS, OHIO.

COLUMBUS, OHIO, June 3, 1898.

Dr. C. O. Probst, Secretary of Ohio State Board of Health:

DEAR SIR: I beg leave to submit the following report upon two projects for increasing the water supply of Columbus which have been submitted to your Board for examination. These projects, although related to each other, are quite different in their natures and are to be considered separately.

The first project is for the construction of a masonry dam at a point some miles above Columbus, to hold a part of the flood flows of the river and to make them available for the supply of the city at times when the waters otherwise available are not sufficient.

The second project is for the reconstruction of a part of the present filter galleries now in use near the Scioto river, and for a considerable extension of them. It is proposed also to construct low temporary dams across the Scioto river near the filter gallery, and to keep these dams filled with water let down from the dam to be constructed above, with the expectation that this water will filter through the gravel forming the bed of the river to the filter gallery, thus materially increasing the supply.

Columbus is at present supplied with water from several sources. A pumping station on the East Side supplies a certain quantity of water from wells near Alum creek. It is not thought feasible to secure an additional quantity of water in this neighborhood. The remainder of the water is pumped to the city from a pumping station near the junction of the Olentangy and Scioto rivers. The water pumped is supplied primarily from filter galleries near the Scioto river and extending up the river for more than a mile. When sufficient water is not secured from the filter galleries an inlet to the Scioto river is opened.

In times of dry weather it sometimes happens that the whole flow of the Scioto river is taken in this way, and the flow has occasionally become so small that when so taken, even in connection with the ground water sources, it has not been sufficient for an adequate supply for the city. The city is growing and the quantity of water required is likely to be greater in the future than it has been in the past. It is thus necessary to look at once for additional sources of supply. The ground water sources have already been developed to such an extent that it seems improbable that a sufficient increase in quantity can be obtained from them, and this being the case the only practical means of securing additional water consists in impounding the waters of one of the streams at or near the city. The Scioto river is believed to be in all respects the most suitable stream for this purpose, and the location of the reservoir suggested by the city is well considered and is apparently the best site available for the purpose. It appears certain, then, that the construction of a dam is necessary for the proper development of the Columbus water supply, and that the site selected is suitable and probably the best that could be found.

Several questions arise in connection with the construction of this dam, however, which do not appear to have been sufficiently considered by the city, and which it would be well to consider further before constructing the dam. These questions relate first to the method in which the water from the dam is to be utilized; and second, to engineering questions connected with the construction of the dam itself.

The city has suggested the temporary use of this water by means of the filter galleries now in use and of others to be constructed, in connection with a series of low temporary dams. As will be shown, if the project is carried out on this basis, it will probably result in the use of the river water direct, in its raw state, more or less commonly; and as the water in its raw state is hygienically objectionable the arrangement now proposed by the city can be regarded only in the light of a temporary expedient which is to be replaced by some better and more thorough system at as early a date as practicable.

The documents submitted to your Board by the city suggest what this permanent method will be, namely, the purification of the river water at or near the proposed dam from which point the purified water will be pumped to the city. To make this water suitable for use as a public water supply it should be softened and filtered. The softening and filtration can be carried out conveniently in connection with each other. The best location for purification works is apparently immediately below the proposed dam where purification could be carried out without necessitating pumping the water twice, as it apparently would be in case the purification works should be located upon high ground in North Columbus, or in the neighborhood of the present pumping station.

It has been suggested that in connection with this dam it will be possible to utilize water power to pump the purified water for a considerable portion of each year, but during the summer at least water power will be insufficient and a steam pumping plant must therefore be installed in any case. It may be found possible to convey the purified water through a gravity conduit to the present pumping station, although there may be some objections to doing so.

In regard to the dam itself, it has been suggested that a moderate increase in the height of dam would increase very largely the quantity of water held and the quantity which could be drawn from it. Raising a dam already constructed is not an easy matter, and if it is likely that a larger reservoir than that now proposed will be required by the city, this should be carefully considered, and the dam should be built high enough to meet the requirements of a long term of years. The topography of the valley, from such examination of it as I have been able to make, aided by the excellent maps of Mr. Julian Griggs, city engineer, appears to be adapted to the construction of a dam at least 20 feet higher than that proposed.

It is also desirable that the ground to be flowed by the proposed dam should be carefully cleaned from trees, stumps, mud, and all other substances which might injure the quality of the stored water. It will hardly be necessary to remove the stony soil which covers a large part of the flowed ground. The construction of this dam will thus involve ultimately, and probably at no remote date, the construction of a purification plant and of a pipe line or conduit from the dam to the city; and probably also of a new pumping station.

The cost of these improvements will be at least several times as great as the cost of the dam itself, and I would suggest the advisability of preparing plans, in as much detail as it may be feasible or necessary, of such works as will necessarily follow the construction of the dam, so that the dam may be constructed to meet the requirements of the final conditions and not merely the temporary conditions following directly its completion.

The construction of the proposed conduit is simply an extension of the present system of supply which has been in use for many years. The conduits now in use are of brick. The proposed conduit is to be of cast iron. The change in material affects only the convenience and economy of construction and in no way the results to be obtained.

The water entering the conduit is made up in part of water seeping to it from the bed of the river, in part through the gravel deposit surrounding the conduit, and from rain water falling upon the gravel deposits in places tributary to the conduit. The extent of gravel tributary to the conduit and which may serve for the collection of rain water is not accurately known. The amount of water which can be obtained from this source does not in general exceed one-third or one-half of a million gallons of water per day for each square mile of tributary area. Mr. Griggs has made certain observations of ground water levels which indicate that the distances from which water is drawn in this way by the conduit are somewhat limited, and it does not appear probable that rain water collected in this way forms a very large part of the supply. At any rate all of the water from other sources than the river itself which can be obtained from the immediate neighborhood of the conduit has been secured by the present conduit, and no important increase in this direction can be looked for. Extending the conduit further up stream may increase somewhat the tributary area, but it does not seem probable that this addition will be important.

The increase in water which may be obtained from the new conduit will thus come principally from the increased seepage from the river. Experiments recently made by Mr. Griggs have demonstrated that water in the gravel enters the conduit very freely, and that the ground water is now drawn down so that its level even on the opposite side of the river from the conduit is considerably below the level of the river. That is to say, if a well is dug close to the river and on the opposite side from the conduit, under normal conditions, the well will be entirely dry at some little distance below the level of the water in the river.

The quantity of water which can be collected by the conduit is thus dependent upon the amount of seepage from the river through its bed into the gravel just below. The water which goes thus far on its journey is taken rapidly to the conduit and pumping station. The last part of the road has a greater carrying capacity than the first part, and it is the first part, namely, the surface of the river bed, which limits the quantity of water obtainable from the conduit.

In judging of the quantity of water to be secured in the future we must be guided largely by the past record. The old conduit has furnished a good deal of water, and extending it further up stream will increase somewhat the area of river bed tributary to the works and the quantity of water obtainable. More water has been obtained in flood periods with the whole river bottom covered with water than at dry times with only a portion of the bottom covered, and the water quantity will be increased at first by the low dams to keep the bottom always covered.

There is another condition which will affect the permanent yield, namely, the silting up of the river bed with fine particles of sediment carried by the river water. This silting up takes place in all rivers where water is taken from them by means of wells or filter galleries, and eventually renders their bottoms almost impervious and cuts off the supply of water. The influence relied upon to correct this tendency is that of freshets. During floods the whole river bottom is stirred up and moved forward, and the material which has become water-tight is moved away and its place taken by fresh material. The influence of freshets in different rivers is very different, depending upon the nature of the bottoms and the rapidity of the flows.

The continued service of the present gallery after many years of use indicates a strong scouring action in the Scioto river. The construction of the proposed dams will reduce the current and increase the tendency to silt up the river bottom. Every precaution should be taken that the dams do not interfere in any way with the scouring from freshet flows, which is indispensable for the continued success of the conduits.

It seems probable, then, that the extension of the conduit system in connection with the various proposed dams will increase somewhat the quantity of ground water which can be obtained. The increase in the quantity of water, which can be reasonably expected, is limited by a number of conditions complex in their nature and beyond control. It does not seem probable that enough ground water can be secured by the proposed conduits, or by any system of conduits which can be constructed in these gravel deposits, to serve as a permanent supply for the city, and if such proves to be the case it is practically certain that any deficiency in quantity will be made up, as at present, by the use of water taken from the Scioto river direct, which water is unhealthy when so used.

The proposed arrangements will thus not provide an adequate supply of pure water for the city, and must be regarded as temporary expedients to be replaced by works near the proposed reservoir as soon as possible.

Whether or not the increased quantity of ground water which can be obtained from the proposed conduits between the time of their completion and the time when they will be replaced by other works will justify the expenditure necessary for their construction is a question to be considered. In this connection it should be remembered that some years may elapse before other supplies are available, and that the water obtained from the conduits is of very much better quality than that from any other source available in the interval, and that the value of this water to the city, even temporarily, may be very great. The water from the conduit, with such reasonable precautions as have been and presumably will be taken, is thoroughly protected from any disease germs which may be in the river water or in the surrounding soil, and is as safe in this respect as any water which can be obtained.

The principal objection that can be raised to its quality is its hardness. The water of the Scioto river is very hard, and the water from the gallery is fully 10 parts harder than the river water, and this increase in hardness seriously interferes with its usefulness in many of the operations for which it is required.

In conclusion, I beg leave to recommend that the project for the construction of the dam be approved, with the recommendation that the flooded area be thoroughly cleaned, and that the subject of the height of dam be carefully considered by the city, and that plans for the ultimate utilization of the water be prepared and submitted to the Board for examination and approval without undue delay. I also recommend the approval of the plans for the extension of the conduits as a temporary expedient in case it shall appear to your Honorable Board and to the city that the value of water so obtained temporarily will justify the expenditure necessary to secure it.

Respectfully submitted,

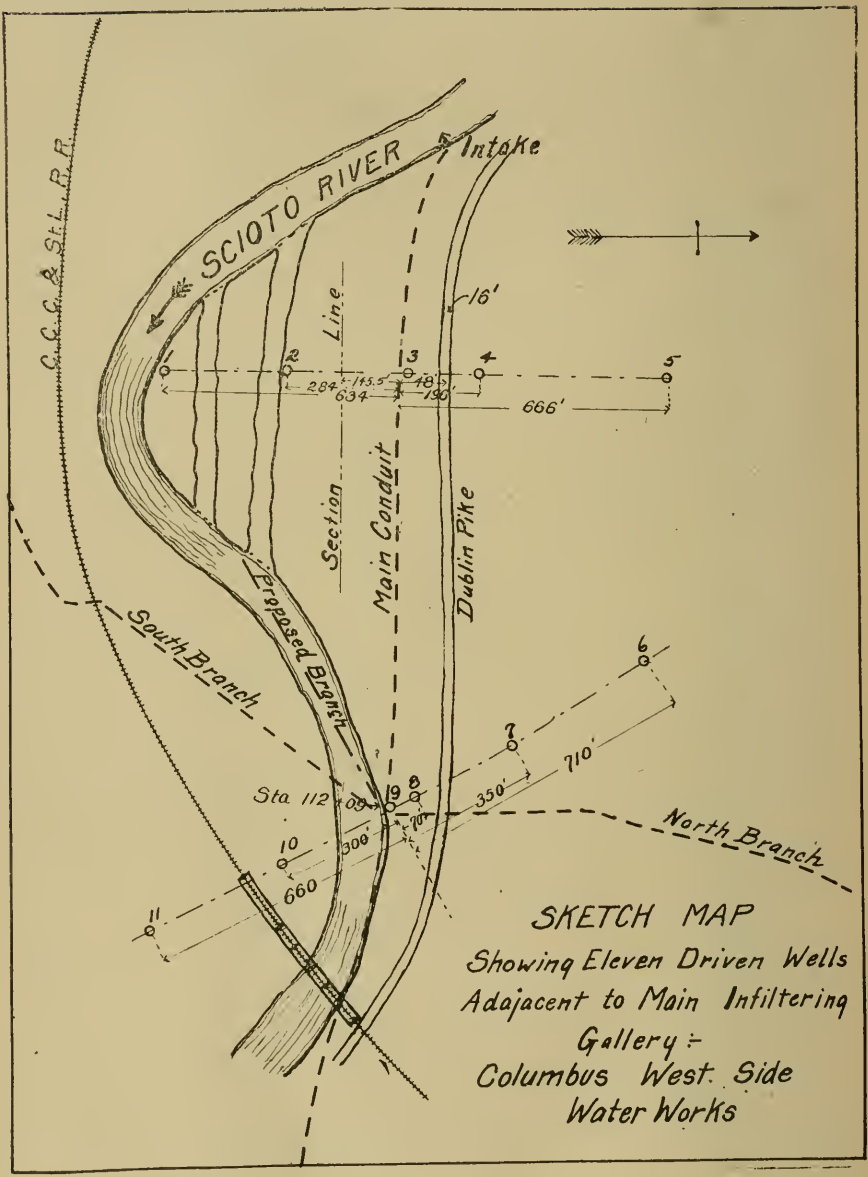
(Signed) ALLEN HAZEN.

EXHIBIT B.

TABLE SHOWING RESULTS OF ANALYSES OF SAMPLES OF WATER—PARTS PER 100,000.

Locality of sample.	Date collected			Color.	Turbidity.	Sediment.	Odor.	Free ammonia.	Albuminoid ammonia.	Nitrogen as nitrites.	Nitrogen as nitrates.	Oxygen required.	Chlorine.	Temporary hardness.	Permanent hardness.	Total solids.	Loss on ignition.	Bacteria per c. c.	Temperature °C.
	Month.	Day.	Year.																
Basin at pump house....	4	21	1897	.....	....	....	....	....	....	....	....	....	1.40	....	....	....	....	....	....
Pump at pump house	4	21	1897	.....	....	....	....	....	....	....	....	....	0 70	....	....	....	....	....	....
Olentangy river at pump house	4	21	1897	.....	....	....	....	....	....	....	....	....	0.35	....	....	....	....	....	....
Scioto river at Big 4 bridge	4	21	1897	.....	....	....	....	....	....	....	....	....	0.20	....	....	....	....	....	....
Well at Big 4 bridge	4	21	1897	.....	....	....	....	....	....	....	....	....	0.80	....	....	....	....	....	....
Intake....................	4	21	1897	.....	....	....	....	....	....	....	....	....	0.15	....	....	....	....	....	....
Filter gallery above Big 4 bridge....................	5	5	1897	0.1	Clear	None..........	None..	.0068	.0092	.0010	0.117	0 28	0 55	22.0	10.6	47.5	6.5	47	12.0
Scioto river at Big 4 bridge	5	5	1897	0.4	Slight	Distinct ...	Slightly musty.	.0034	.0290	.0005	0.200	0.75	0.20	17.6	9.6	40.0	7 0	579	20.0
Basin at pump house.......	5	5	1897	0.15	Very faint......	Very slight.	Very faint mu'y	.0064	0142	.0009	0.067	0.33	1.40	22.4	12 0	50.0	10.5	232	16 0
Pump at pump house.....	5	5	1897	0.1	Clear	Faint...........	" "	.0054	.0086	.0005	0.114	0.20	0.70	22.4	13 0	51.0	7.5	222	12.5
Olentangy river at pump house	5	5	1897	0 4	Slightly turbid	Slight	Slightly musty..	.0020	.0266	.0006	0.120	0.69	0 17	14.8	6.0	30.5	6.5	877	20.2
Scioto river at Big 4 bridge	5	9	1897	0.6	Marked	Distinct	Musty	.0078	.0422	.0002	0.180	0 94	0 10	15.0	5 8	34.5	6 0	2341	17.5
Basin at pump house..	5	9	1897	0.15	Trace............	Slight	Trace musty	.0044	.0202	.0005	0.067	0.34	1.45	22.4	12.0	52.0	9.5	293	12 0
Filter gallery above Big 4 bridge....................	5	9	1897	0.1	Clear	None...........	None	.0072	.0094	.0006	0.107	0.22	0 60	21.6	12.0	48 0	7.0	276	12.0
Pump at pump house.....	5	9	1897	0.1	Trace............	Trace...........	None...............	0060	.0096	.0003	0.107	0 19	0.77	22.8	18.2	51 0	8 0	156	18 0

EXHIBIT C.


C.C.C. & St.L. R.R.
SCIOTO RIVER
Intake
Section Line
Main Conduit
Dublin Pike
16'
1
2
3
4
5
284
145.5
48
634
196
666'
Proposed Branch
South Branch
North Branch
Sta 112+05
6
7
8
9
10
11
300'
660
70'
350'
710'
SKETCH MAP
Showing Eleven Driven Wells
Adajacent to Main Infiltering
Gallery:-
Columbus West Side
Water Works

RECORD OF GROUND WATER IN DRIVEN WELLS ADJACENT TO WEST SIDE INFILTERING GALLERY.

ELEVATIONS ABOVE CITY DATUM.

Inches of rainfall.	Date.	Hour.	River opposite the intake well.	Intake well.	Well No.											Basin.	River near Well No. 9.
					1	2	3	4	5	6	7	8	9	10	11		
.50	1898. May 6																
.61	“ 7																
	“ 8																
	“ 9																
.15	“ 10																
.69	“ 11																
1.20	“ 12																
	“ 13																
T	“ 14																
81	“ 15																
.16	“ 16	9.15 A. M. to 11.00 A. M.		20.00		27.89		22.86	23.93	20.51	19 46	19.99			23.29	19.26	27.60
	“ 17	9.80 “ 11 00 “	29.17	20.24		27.49	16.86	23.21	24.17	20.52	20.83	20.30			23.88	19.40	27.19
06	“ 18	9 15 “ 10.45 “	28.16	19.44		26 71	16 84	23.21	24.81	20.64	20.49	20.28		25.58	24.01	19.43	26.00
.32	“ 19	8.80 “ 10.00 “	27.62	19.10		26.06	16 75	23 11	24.89	20.64	20.42		18.84	24.65	23.70	18 03	25.07
.05	“ 20	9.15 “ 12.00 “	27.21	18.04	26.89	25.73	17.82	22.98	24.46	20.77	20.26	19 05	18.47	24.14		18 09	24.61
	“ 21	8.80 “ 10 00 “	26.72	17.97	26.47	25 26	17 33	22.74	24 42	20.75	20.07		17.80	23 64	23.13	16.55	24.15
T	“ 22																
	“ 23	8.30 A. M. to 10.00 A. M.	26.87	18.29	26.35	24.99	17.31	22.88		20.61	19.52	18.31	18.03	23 41	22.66	16.92	24 30
20	“ 24	8.00 “ 10.15 “	26.90	17 31	26.33	24 88	17.24	22.65	24.30	20.60	19.40	18.15	18.16	23.48	22 58	16 34	24.35
.11	“ 25	8 00 “ 10 30 “	26.46	17.52	26 01	24 64	17.37	22.46	24.24	20.54	19.18	17.56	17.35	22.95	22 41	16 52	23.65
	“ 26	8 10 “ 9.30 “	26 08	16.74	25 72	24.34	17.39	22.34	24.17	20.47	19.02	17.37	17.25	22.52	22.18	16.53	23.32
	“ 27	8 00 “ 10.00 “	25.80	16 74	25.44	24.06	17.31	22.23	23.98	20.34	18.81	16.71	17.00	22.11	21.97	14 05	22 89
	“ 27	10.30 “ 11 00 “		16 69												14.00	
	“ 27	12.45 P. M. to 2.15 P. M.	25.74	16 71		24 00	17.31	22.07	24.12	20.46	18 74	16.03	15.68	22 00	21.92	14 98	
	“ 27	2.50 “ 3 35 “		16 70		23.96	17.34	22.03	24.05	20.45	18.74	15.81	15 44			14.43	
	“ 27	4 28 “ 5 56 “	25.70	16.71	25.31	23.91	17.31	22.01	24.06	20.44	18.72	15.60	15.25	21.92	21.94		22.78
1.09	“ 28	8.00 A. M. to 11 00 A. M.	25 52	16 72	25.21	23.83	17 31	22.03	24.00	20.41	18.48	16.09	15.87	21.75	21.75		22.64
	“ 29																
T	“ 30																

Total rainfall, 5 95 inches.

ANALYSIS OF RECORD OF GROUND WATER IN DRIVEN WELLS ADJACENT TO WEST SIDE INFILTERING GALLERY SHOWING THE FALL IN GROUND WATER IN GIVEN PERIODS AND THE MINIMUM AND MAXIMUM SLOPE OF SAME.

Date, 1898. May.	Period—Days.	No. of well.	Fall in ground water at wells in period named—feet.	Horizontal distances between wells—feet.	Slope of ground water.			
					Minimum.		Maximum.	
					Total feet.	Ratio.	Total feet.	Ratio.
20-28	8	1	1.68	......	......	......	......	......
	8	2	1.90	350.	1.16	$\frac{1}{301}$	1.38	$\frac{1}{263}$
	8	3	00	284.	6.52	$\frac{1}{44}$	8.42	$\frac{1}{34}$
	8	4	1.18	196.	4 72	$\frac{1}{41}$	5.90	$\frac{1}{33}$
	8	5	46	470.	1.25	$\frac{1}{376}$	1.97	$\frac{1}{238}$
16-28	12	6	.36	......	......	......	......	......
	12	7	2.01	360.	.28	$\frac{1}{1286}$	1.93	$\frac{1}{186}$
	12	8	4.21	280.	.19	$\frac{1}{1474}$	2.37	$\frac{1}{118}$
19-28	9	9	2.97	......	......	......	......	......
	9	10	2.90	325.	5.81	$\frac{1}{56}$	5.88	$\frac{1}{55}$
	9	11	1.95	260.	.00	.00	.95	$\frac{1}{379}$

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, June 10, 1898.

Mr. Felix A. Jacobs, Director of Public Improvements, Columbus, Ohio:

DEAR SIR: The State Board of Health has considered your application for approval of certain changes and extensions of the water supply for the city of Columbus, as set forth in communications from you under date of April 20, 1898; namely, the construction of a dam in the Scioto river, for the storage of water, about five and one-third miles from the West Side pumping station, and to extend the filter gallery system along the Scioto river.

You are hereby notified that the proposed changes and extensions have been approved by the Board, subject to the following conditions:

(*a*) That the ground to be flooded by water by the proposed dam shall be stripped of vegetation and upper layers of soil (earth).

(*b*) That completed plans for purifying the stored water by filtration, in a satisfactory manner, be submitted to the State Board of Health within a reasonable time.

(*c*) That from and after the completion of the proposed changes and extensions of the gallery system no water shall be taken direct from the Scioto or Olentangy rivers to be supplied to the city.

Yours truly,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON PROPOSED IMPROVEMENTS IN THE WATER SUPPLY OF DENNISON AND UHRICHSVILLE.

To the State Board of Health:

Gentlemen: At the meeting of the Ohio State Board of Health, held at Columbus, April 20, the Dennison Water Supply Company made application for approval of a plan for purification of the water furnished by said company to the towns of Dennison and Uhrichsville which are contiguous. The application was in writing and included lengthy specifications.

The result of observations during a visit to the locality, made on the 16th instant, may be briefly stated as follows:

The water is obtained from the Big Stillwater creek which flows through a comparatively wild and sparsely settled district. There are so many springs on its course, and especially near the intake, that impounding for dry seasons can safely be dispensed with. The pumping station is about one and one-half miles from the town, and is separated from it by a high ridge.

By the present arrangement the water is admitted from the creek into a crude water well about five feet in diameter; thence, by a pipe, into a pumping well, about 20 feet in diameter, and 30 feet deep and from thence it is pumped into a reservoir about 200 feet high, located at the top of the ridge separating the valley in which the towns are located from the valley of the Big Stillwater. The amount of water supplied is not far from 1,000,000 gallons daily.

The sides of all the streams in this vicinity are of clay earth, and quite precipitous, assuring an active flow and much washing of mud into the stream channels after rains. All complaints of water, either from the health authorities or others, were confined to the muddy water furnished after rains and thaws. The proposed filter has for its purpose only the freeing of the water from the earthy and organic matters held in suspension.

For the accomplishment of this purpose a filter bed is proposed, adjacent to the pumping well, having the following dimensions: 60 x 100 feet at the bottom, 120 x 160 feet at the top, and 14 feet deep. The bottom and sloping sides are to be made impervious by brick masonry and cement. The filtering material proposed is, beginning at the bottom, first, one foot of coarse gravel; second, six inches of fine gravel; third, six inches of coarse sand; fourth, one foot of fine sand from which all dirt has been removed. Proper specifications indicate to the proposed contractor the gradients and material to be used.

Further mention of the details of the system, having reference to the collection of the purified water below, and the scraping and renewal of the sand at the top, is probably not required. Although the plan proposed is not in use in Ohio there are precedents, and examples of its successful employment in other states for its special purpose.

The water furnished by the Dennison Company is quite soft and its sanitary repute is unusually favorable. The company is liberally patronized by water takers in both towns. Upon inquiry Dr. Hughes, health officer of Dennison, said that no hygienic objection could be made to the supply. He protested decidedly against the mud and said the complaint on that score was universal. Dr. McCollam, health officer of Uhrichsville, confirmed these statements. Turning to his register he read the death list of Uhrichsville—population 5,000—for the last eight months as follows :

	UNDER ONE YEAR.	OVER ONE YEAR
October, 1897	0	1
November, "	2	2
December, "	3	4
January, 1898	1	1
February, "	0	0
March, "	1	7
April, "	0	3
May, "	0	0

This list includes the still-born. There was an invasion of diphtheria in March. Typhoid fever was so rare as to be almost unknown as a cause of death.

Having good reason to believe that the proposed filter will, if properly cared for, correct existing objections to the water, we recommend its approval by the Board.

JOSIAH HARTZELL,
WM. T. MILLER,
J. C. CROSSLAND,
Committee.

June 20, 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, July 8, 1898.

Mr. James F. Forbes, District Superintendent Dennison Water Supply Co., Dennison, Ohio :

DEAR SIR : The State Board of Health has considered plans presented by you for the filtration of the public water supply of Dennison and Uhrichsville, Ohio, and you are hereby notified that said plans have been approved.

Yours truly,

(Signed) C. O. PROBST,
der of the Board. *Secretary.*

REPORT ON THE FILTRATION OF THE WATER SUPPLY OF LAKESIDE.

To the State Board of Health:

GENTLEMEN: At a meeting of the Board held June 8, 1898, the Lakeside Assembly Company was required "to put in operation for their entire water supply some approved system of water filtration." The Company submitted the plans, by Mr. J. P. Force, engineer, which were referred to the Board, and approved as a temporary expedient. The filters were put in operation July 14, 1898, and were examined July 16. This examination showed a slight improvement of the water after filtration, from a chemical standpoint, and a marked improvement in the appearance of the water. Bacteriologically, the unfiltered lake water contained 350 bacteria per c. c. while the filtered water contained 590 for tank No. 1, 523 for tank No. 2, and 610 for tank No. 3. As the tanks had been in operation less than 48 hours, this test was not considered of much value. After the filters had been in operation a series of tests were made extending from July 30 to August 3. Thirty-eight bacteriological examinations were made at different hours of the day, and special attention was paid to the effect of cleaning the filters by scraping.

The average efficiency of tank No. 1, in 12 tests was 55.3 per cent. removal. For tank No. 2, 11 tests, 64.7 per cent., and tank No. 3, nine tests, 63.3 per cent. removal. During all this time the lake water was comparatively low in bacteria, ranging from 352, the lowest, to 525 per c. c. the highest. The filtered water contained, throwing out one test not fairly countable, 67, the lowest, to 300 per c. c., the highest. Only twice was the product of tank No. 1 below 100 per c. c., and the same is true of tanks Nos. 2 and 3. Scraping impaired the efficiency of tank No. 1, and slightly increased that of tanks Nos. 2 and 3. No means were available for measuring the rate of filtration. The filters were calculated to give a combined flow of 24,000 gallons per 24 hours. The arrangement for regulating the rate of filtration was not working satisfactorily and it is probable that at times a much higher rate than provided for was attained.

In studying the figures in relation to the hours of the day and the days of the week, it is found that on an average the efficiency of the filters was least at the time of day when they were in greatest demand, and also on Saturday, Sunday and Monday, when the greatest number of people were on the grounds.

After receiving the report of the bacteriologist I notified the Lakeside Company, and also the consulting engineer, that the filters were not giving satisfactory results, and that necessary changes, especially in the matter of controlling rate of filtration should, be made at once.

The company about this time went into a receiver's hands. August 27 and 28 further examinations of the filters were made. The filters were apparently working at a slower rate and giving better results. Six tests of filter No. 1, showed an average reduction of bacteria of 81.5 per cent. The greatest number left in the filtered water was 220 per c. c., and the least 27. In four out of six tests the number was less than 70 per c. c. The unfiltered lake water was some higher in bacteria than at the time of the former examination. Tank No. 2 gave better results, with an average removal of bacteria of 88.6 per cent. In all of the tests, six in number, the bacteria were below 75 per c. c. The average of tank No. 3 was the highest, being 91.7 per cent. of removal. In all but one test the bacteria were below 45 per c. c. The highest was 90.

On the whole, the filters gave fairly good satisfaction, and the last tests made show that it is possible to operate them so as to get very good results.

I have so far not heard of a case of typhoid fever contracted at Lakeside this year. All wells on the grounds were closed. My attention was called to the ice supply, cut in the lake some little distance from the mouth of the sewer. Two samples of ice were examined. One, the best to be found in the ice house, the other the worst. The former contained 615 bacteria per c. c.; the latter 23,400. Only the best ice, it was claimed, was put into water used for drinking purposes.

I would recommend that the receiver of the Lakeside Assembly Company be informed that, if the grounds are to be opened to the public next year, the filters must be placed in good condition ; that changes must be made which will insure that the rate of filtration shall never be greater than their estimated maximum capacity, and that another filter be added to insure having a sufficient supply.

Following is the report of the chemist and bacteriologist upon his examination of the filters, and also a description of the manner of their construction as furnished by Mr. J. P. Force, the engineer:

REPORT OF THE CHEMIST AND BACTERIOLOGIST.

Three samples were taken July 16, and submitted to a chemical and bacterial analysis with the following result:

Parts per million.	Unfiltered.	Filtered.	Filtered.
		Filter No. 1.	Filter No. 3.
Color	.05	.00	.00
Turbidity	very slight	none	none
Sediment	“	“	“
Odor	none	“	“
Oxygen required	1.633	1 500	1.418
Nitrogen as free ammonia	.039	.006	.018
Nitrogen as albuminoid ammonia	.106	.074	.084
Nitrogen as nitrates	.408	.382	.333
Nitrogen as nitrites	none	none	none
Chlorine	9 8	8.9	9.
Temporary hardness	86.6	87.8	86.2
Permanent “	3.96	4 02	3.90
Total solids	209.	196.	207.
Loss on ignition	99.	49.	60.
Bacteria per c. c	350.	590.	610.

A count was made of the number of bacteria from tank No. 2, and gave 523 per c. c. The efficiency of the filters should not be determined by a comparison of the unfiltered and filtered waters at this time. The filters had just been constructed and had been in use less than 48 hours. Within seven hours of the test the regulators were entirely removed and no check to the rapid flow of water was present. The tanks were filled with unfiltered water from below. After the impurities thus carried in were washed out the filtered water would show better results both chemically and bacteriologically.

Further examination of the filters was conducted from July 30 to August 3, 1898. In all 38 examinations were made. The bacteriologist reports as follows:

I feel that test number 12 (tank three) should be dropped as the very high number of bacteria is not compatible with the preceding and succeeding examinations of the same tank. The result must have been due to an accidental contamination. I have omitted test number 12 in my computations.

One test, number 13, (tank 1) gave an increase of bacteria in the effluent. It was made one hour after starting the filter after scraping. In addition to this it should be noted that at the time of this test the unfiltered water was lowest in number of bacteria thus increasing the percentage. Aside from the two tests the efficiency of the filters varied from 14.7 per cent. to 84.8 per cent.

TESTS OF EFFICIENCY.

Filter.	No. of test.	Minimum efficiency.	No. of test.	Maximum.
1.	14	14 7% (regulator caught)	6	83.5%
2.	7	40.8%	27	84 8%
3.	4	34.1%	8	84 4%

Average efficiency of No. 1 in 12 tests........................55.3% (note below).
" " No. 2 " 11 " 64.7%
" " No. 3 " 9 " 63.3%

Test No. 13 is included in the above estimate on average efficiency. While I do not feel that No. 13 can be dropped, yet I would call attention to the fact that owing to the circumstances mentioned above in that test it lowers the average efficiency more than it should. Without it the average efficiency of filter No. 1 in 11 tests would be 65.7 per cent., which makes a remarkably close result for the three filters showing that they are on the whole doing very similar work.

EFFECT OF SCRAPING ON EFFICIENCY.

Tank No. 1, average efficiency before scraping (3 tests)........................70.9%.
" " " " after " (9 ")........................50.1%.
" " omitting test No. 13 " " (8 ")........................63.8%.
" No. 2, average efficiency before scraping (3 ")........................57.2%.
In two of these tests (No. 3 and No 7, regulator was caught.
" " average efficiency after scraping (8 tests)........................67.6%.
" No. 3, " " before " (2 ")........................59 2%.
" " " " after " (7 ")........................64.5%.

It will be seen that scraping decreased slightly the efficiency in tank No. 1, while it apparently increased the efficiency in the other two. The catching of the regulator may have affected the efficiency in tank No. 2 in two-thirds of the tests before scraping. With tank No. 3 one (4) of the two tests before scraping was low in efficiency, having been made at a time when there was probably a heavy demand on the filters and thus a rapid filtration.

The question of the effect of the rate of filtration upon the efficiency can be reached only by inference, as the rate was not known. The question as to whether the demand for water could affect the rate of filtration is one for the engineer to settle, but in that connection it may be of interest to note the results when our tests are grouped (with day and hour accompanying) in order, according to their efficiency. In each tank the most efficient test is given first then the next most efficient and so on. I give the day of the week in place of the date to facilitate locating the influence of the number of people. Saturday was a heavy day, many people being present and staying until Monday.

TABLE OF EFFICIENCY VS. DAY AND HOUR.

	A.			B.			C.		
No. of Filter	Day.	Hour.	Effic.	Day.	Hour.	Effic.	Day.	Hour.	Effic.
1.	Sun.	7 a.	83.5 %	Wed.	1 p.	74.7 %	Mon.	3 p.	60.7
	Tu.	6 a.	82.8	Wed.	9 a.	73.2	Mon.	10 p.	49.6*
	Tu.	12 m.	77.5	Sat.	2 p.	68.6	Mon.	8 p.	14.7*
	Wed.	5 a.	77.	Tu.	5 p.	60.8	Mon.	6 p.	inc. 59.6*
2.	Tu.	7 p.	84.8 %	Wed	9 a.	69.4	Tu.	12 m.	56.5*
	Mon.	3 p.	77.5	Tu.	9 p.	62.4	Sat.	2 p.	53.3
	Tu.	2 p.	73.8	Wed.	1 p.	60.9	Sun.	7 a.	40.8
	Wed.	7 a.	72.4	Tu.	8 a.	60.			regulat'r caught
3.	Sun.	7 a.	84 4 %	Tu.	9 p.	73.6	Wed.	9 a.	49.5
	Wed.	6 a.	82.7	Tu.	6 p.	73.4	Wed.	1 p.	43 8
	Tu.	4 p.	77.	Tu.	2 p.	51.6	Sat.	2 p.	34.1

Group A—efficiency. B—less efficiency. C—least efficiency.

Of the 11 tests in A, six are early morning hour tests, before many people were out. The one remaining early hour test is found in group C, but with the regulator caught.

In the least efficient group, C, are 10 tests, one the early hour test just spoken of, one a later hour test, and the remaining eight tests, at times when the people were awake. On the other hand four (*) of these 10 "least efficients" were made within five hours after scraping. Again in observing the position of the Sunday, Monday and Saturday tests, when the large numbers of people were supposed to be present, I find seven of these tests in group C, one in B, and three only in A, while two of these three were early hour tests. The time required for each filter to regain its average efficiency after scraping was: No. 1, 13 hours; No. 2, 5 hours, and No. 3, 3 hours.

BACTERIAL EFFICIENCY.

TESTS MADE JULY 30, 31, AUGUST 1, 2, 3.

TANK NO. 1.

No. of examination.	Day. Date. Hour.	No. of hours after cleaning.	No. of bacteria per c. c.—Unfiltered.	No. of bacteria per c. c.—Unfiltered.	Per cent. of reduction.
2	Saturday, July 30, 2 p. m.	0	525	165	68.6
6	Sunday, “ 31, 7 a. m.	0	431	71	83.5
10	Monday, August 1, 3 p. m.	0	352	138	60.7
	“ “ 1, 5 p. m.	Filter started after cleaning.			
13	“ “ 1, 6 p. m.	1	352	562	59 6*
14	“ “ 1, 8 p. m.	3	352	300	14.7
15	“ “ 1, 10 p. m.	5	352	177	49.6
16	Tuesday, “ 2, 6 a. m.	13	507	86	82 8
19	“ “ 2, 12 m.	19	507	113	77.5
25	“ “ 2, 5 p. m.	24	507	198	60 8
30	Wednesday “ 3, 5 a. m.	36	523	120	77.
34	“ “ 3, 9 a. m.	40	523	140	73 2
36	“ “ 3, 1 p. m.	44	523	132	74.7
	Average of 12 tests.				55.3
	Omitting No 13				65.7

*Increase.

TANK No. 2.

No. of examination.	Day. Date. Hour.	No. of hours after cleaning.	No. of bacteria per c c.—Unfiltered.	No. of bacteria per c. c.—Filtered.	Per cent. of reduction.
					Reg. caught.
3	Saturday, July 30, 2 p. m...........	0	525	245	53.3 *
7	Sunday, " 31, 7 a. m............	0	431	255	40.8 *
11	Monday, August 1, 3 p. m	0	352	79	77.5
	Tuesday, " 2, 7 a. m............	Filter started after cleaning.			
17	" " 2, 8 a. m......... ..	1	507	202	60.0
20	" " 2, 12 m	5	507	220	56.5
22	" " 2, 2 p. m............	7	507	132	73 8
27	" " 2, 7 p. m............	12	507	76	84 8
28	" " 2, 9 p. m......	14	507	190	62.4
32	Wednesday " 3, 7 a. m............	24	523	144	72.4
33	" " 3, 9 a. m...........	26	523	160	69.4
37	" " 3, 1 p. m...........	30	523	204	60.9
	Average of 11 tests...............	....	....	....	64.7

*Regulator caught.

TANK No. 3.

No. of examination.	Day. Date. Hour.	No. of hours after cleaning.	No. of bacteria per c. c.—Unfiltered.	No. of bacteria per c. c.—Filtered.	Per cent. of reduction.
4	Saturday, July 30, 2 p. m........ ...	0	525	346	34.1
8	Sunday, " 31, 7 a. m............	0	431	67	84.4
12	(Monday, August, 1, 3 p. m...........	0	352	12260	338.2*
	Tuesday, " 2, 1 p. m......... ...	Filter cleaned and started.			
23	" " 2, 2 p. m	1	507	245	51.6
24	" " 2, 4 p. m...........	3	507	116	77.0
26	" " 2, 6 p. m...........	5	507	134	73.4
29	" " 2, 9 p. m...........	8	507	133	73.6
31	Wednesday, " 3, 6 a. m...........	17	523	90	82.7
35	" " 3, 9 a. m...........	20	523	264	49.5
38	" " 3, 1 p. m...........	24	523	294	43.8
	Average of 9 tests............				63 3

* Increase.

TESTS MADE AUGUST 27 AND 28.

TANK No. 1.

No. of test.	Date. Hour.	Bacteria per c. c.—Filtered.	Bacteria per c. c.—Unfiltered	Per cent. of reduction.
1	August 27, 9:30 p. m....................................	68	613	88.9
5	" 28, 7:00 a. m.........	220	534	58.8
9	" 28, 10:00 a. m..........	54	290	77.7
13	" 28, 12:00 m.......................	42	266	84.2
17	" 28, 3:00 p. m..	116	640	81.9
21	" 28, 6:00 p. m..........................	28	508	94.5
		528	2,851	81.5

Minimum reduction..	58.8 %
Mamimum reduction	94 5 %
Average reduction	81.5 %

The lower hoop on this tank burst August 26, and the tank was leaking badly. The regulator was caught in the first three tests.

TANK NO. 2.

No. of test.	Date.	Hour.	Bacteria per c. c.—Filtered.	Bacteria per c. c.—Unfiltered.	Per cent. of reduction.
2	August 27,	9:30 p. m.	72	613	88.3
6	" 28,	7:00 a. m.	52	534	90.3
10	" 28,	10:00 a. m.	24	290	91.7
14	" 28,	12:00 m.	70	266	73.7
13	" 28,	3:00 p. m.	74	640	88.4
22	" 28,	6:00 p. m.	32	508	93.7
			324	2,851	88 6

Minimum reduction .... 73.7 %
Maximum reduction .... 93.7 %
Average reduction .... 88.6 %

TANK NO. 3.

No. of test.	Date.	Hour.	Bacteria per c. c.—Filtered.	Bacteria per c. c.—Unfiltered.	Per cent. of reduction.
3	August 27,	9:30 p. m.	90	613	85.3
7	" 28,	7:00 a. m.	24	534	95.5
11	" 28,	10:00 a. m.	16	290	94.5
15	" 28,	12:00 m.	34	266	87.2
19	" 28,	3:00 p. m.	44	640	93.1
23	" 28,	6:00 p. m.	28	508	94.5
			236	2,851	91.7

Minimum reduction .... 85.3 %
Maximum reduction .... 95.5 %
Average reduction .... 91.7 %

I believe the filters are more efficient than the above figures would indicate.

Whenever a regulator was caught the workmen would reach down in the regulator box with a garden rake and pull the regulator up.

The samples had to be taken from the same tap which necessitated emptying the pipe of one water, and then allowing it to fill with the succeeding water.

Both of these factors would disturb the bacteria growing in the filtered water on the sides of the vessels (pipes or regulator boxes), and so an unknown portion of the bacteria in the filtered water was due to this cause.

The filters were working at a much slower rate during the last examination. Very little water was received from tank No. 1, owing to leakage.

(Signed) ELMER G. HORTON,
Bacteriologist.

Respectfully submitted,
C. O. PROBST,
Secretary.

DESCRIPTION OF THE MANNER OF CONSTRUCTION OF FILTERS AT LAKESIDE.

Mr. S. R. Gill, Secretary Lakeside Company, Lakeside, Ohio :

SIR : I present herewith plans for the filtration of the water supply of Lakeside. As the filters must be installed by the 14th of July, and the approval of the State Board of Health of the plans obtained, in the meantime, I find it impossible to plan anything suitable for the purpose, which can be constructed in so short a time, except by taking advantage of all facilities and materials on the ground, and by using them to the best advantage. By so doing you can provide a limited supply of water which for purity and freedom of harmful bacteria will, I believe, answer all the requirements of the State Board of Health. Should this supply prove inadequate, you can supplement it by the construction of additional filters on the present plan, or provide more permanent ones constructed of masonry.

In the purification of a public water supply three different systems of filtration are in use: continuous, intermittent and mechanical. The first two differ more essentially in the manner of working, which is as indicated by the name of the process. A continuous filter acts mainly as an exceedingly fine strainer, removing the suspended or insoluble matter and bacteria in the water, but having only a slight effect on the soluble organic matter. With an intermittent filter the soluble organic matter is reduced to a greater extent, but as a rule the removal of bacteria is no greater, if as great, as in a continuous filter.

Mechanical filtration includes the use of alum as a coagulant when properly carried out, and the expense of operation is consequently greater than for the other methods named. The fact that you can construct unpatented filters of equal or greater efficiency at less expense than you can purchase the patented mechanical filters, leaves the latter out of the discussion.

It has been established that typhoid fever is produced by certain specific organisms usually communicated by drinking water containing them, and as the water obtained at Lakeside is under suspicion, I deem it sufficient to provide for the removal of bacteria by continuous filtration. I find, by an examination at Lakeside, that you have two wooden tanks 12 and 13½ feet in diameter respectively, at present used as storage tanks, and that you can readily provide a third one 14 feet in diameter, all eight feet high. In addition you have a tank 11 feet in diameter and six feet in height. I also find that you can obtain an excellent sand of .14 mm. effective size at Sandy beach, a coarse sand at Bay shore, and an excellent gravel in your neighborhood.

I have accordingly arranged a plan for the filtration of your water supply comprising the use of the three large tanks as continuous filters and the smaller one for the storage of filtered water.

The rate of filtration, or amount of water allowed to pass through the filters, is calculated at the rate of 2.57 million gallons per acre, or about 59 gallons per square foot in 24 hours. This being the rate used at some of the most prominent filtration works in Germany where the results have been excellent.

The filtering material proper is to be the fine sand from Sandy beach, to a depth of three feet, with eight inches of graduated material beneath it, the whole resting on four inches of coarse gravel, which in turn rests on a false bottom in the tank, consisting of 2 x 4-inch scantling laid flat on 2 x 4-inch stringers on edge, notched on the lower edge to admit of the free passage of water.

It is an essential condition to the perfect operation of a filter of this description that the rate of filtration should be uniform, and should not exceed a certain fixed rate at any time. As the loss of head increases with the time the filter is in use between times of cleaning by the accumulation of suspended matter on the surface of the sand which produces increased friction, and as when the loss of head increases the rate diminishes. It is impossible to control the rate of filtration by regulating the size of the fixed outlet. I have accordingly arranged for the regulation of the rate by providing a floating outlet which will at all times receive the filtered water under the same head of pressure, independent of loss of head in the filter. When the loss of head, however, reaches the limit which I have fixed at 30 inches, the outlet will be closed and the filter will require cleaning by the removal of the dirty sand from the surface. It is my purpose to adjust the floating outlet to the proper rate after the filters are constructed and before they are used. The removal of the dirty sand from the filter will be necessary, as near as can be estimated, once every 12 days for each filter, or in rotation one filter can be cleaned every four days. As it is important in your case that the maximum work be accomplished by each filter, it would be well to arrange for cleaning them at night. When a filter is to be cleaned the supply will be shut off and the valve on the outlet communicating with the main closed. The drain outlet in the bottom of the tank will then be opened and all water drained off. The surface of the sand containing the sediment will be removed easily with a broad flat shovel to the necessary depth, which need not exceed three-fourths of an inch. After cleaning, the drain will be closed and the valve on the *outlet to the main* opened. As the filters are all at the same level the filtered water will find its way back and fill the newly cleaned filter *from the bottom*. This is done to prevent the disturbance of the sand by a stream from the top and the greatly increased rate of filtration on filling the filter. After the filter is filled the supply can be turned on from the top as before.

The sand to be used in these filters is to be washed before use.

When by removal by cleaning the fine sand shall have been reduced to a thickness of two feet it must be replaced by clean fine sand.

We now come to the subject of capacity. The following table gives the total amount of water to be obtained from the three filters at the rate fixed, viz.: 2.57 million gallons per acre of filter surface in 24 hours.

NO. OF FILTER.	AREA IN SQUARE FEET.	GALLONS DAILY.
1	113.09	6,672
2	143.13	8,444
3	153.93	9,081
Totals,	410.15	24,197

It will be seen that the total supply of filtered water will be about 24,000 gallons daily, which, placing the population at 3,000, gives eight gallons per diem per capita only. It is true that at Lakeside the ordinary provision of water made for towns would be excessive. There is no manufacturing, and no supply for extinguishing fires provided. A large portion of the summer inhabitants are transient, and their clothing is washed away from the Assembly grounds. Bathing, to a large extent, takes place in the lake. The fact remains true, however, that the limited amount of water provided by the three filters contemplated at present is extremely small, and can only be considered in the light of a temporary expedient. By the arrangement contemplated, however, *all* the water supplied to the pipe system will pass through the filters and no one can obtain raw unfiltered water, except by drawing it from the lake direct. Thus the public will be protected as to the quality of the supply, and if the plan of filtration is approved by the State Board of Health, you can extend it by constructing additional filters of sufficient area to meet the demand.

The use of the 11 foot tank before alluded to, for the storage of filtered water, will aid in balancing the supply from the filters by storing the excess when the demand is light, and furnishing it when the demand exceeds the constant supply. This tank will hold 3,910 gallons. By the addition of one more storage tank of this capacity you will receive the maximum capacity of filters. If the plan submitted is approved by the State Board of Health, I will visit Lakeside and attend to the washing and placing of sand in the filters and the adjustment of the effluent regulators.

Very respectfully,

Jno. P. Force,
Consulting Engineer.

REPORT ON WATER SUPPLY FOR THE STATE HOSPITAL FOR INSANE AT MASSILLON.

To the State Board of Health:

Gentlemen: Application has been made by Dr. A. B. Richardson, Superintendent of the Massillon Hospital for Insane, to approve the water supply proposed for that institution.

Water is to be obtained from three bored wells, near together, and located on the grounds of the institution, but removed from any visible source of contamination. The wells are 375 feet deep, in sand rock covered with gravel and sand. Water-bearing rock was found at 225 feet and the wells are cased to the rock. A sample of the water was collected from one of the wells and submitted to chemical examination. Following is the report of the chemist:

Columbus, Ohio, May 11, 1898.

Dr. C. O. Probst, Secretary of the State Board of Health, City:

My Dear Sir: Following is report upon analysis of sample of water marked "Massillon," received April 20, 1898:

Sanitary analysis.	Parts per 100,000
Free ammonia	.0406
Albuminoid ammonia	.0044
Nitrogen as nitrites	none
Nitrogen as nitrates	none
Oxygen required	0.04
Chlorine	0.30
Temporary hardness	24.0
Permanent hardness	none
Total solids on evaporation	28.0

Mineral analysis.	Parts per 100,000.	Grs. per gallon.
Potassium sulphate	0.57	0.33
Sodium chloride	0.59	0.34
" sulphate	1.93	1.12
" carbonate	2.03	1.18
Calcium "	15.65	9.13
Magnesium "	5.81	3.39
Oxides iron and alumina	0.20	0.12
Silica	1.30	0 78
Totals	28.08	16.39

The sanitary analysis indicates a deep well water of high organic purity. The high free ammonia is no drawback to such a water as it is due to reduction of nitrates. If the water was from a shallow well it would of course be ground for objection.

The mineral analysis shows a moderately hard water free from sulphate of lime, hence easily treated for boilers. The total scale forming ingredients are 22.96 parts in 100,000, or 13.42 grains to the U. S. gallon.

Yours very respectfully,

(Signed) N. W. Lord.

I have the honor to recommend that the proposed water supply for the Massillon Hospital for Insane be approved.

Very respectfully,

C. O. Probst,

Secretary.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, May 23, 1898.

Dr. A. B. Richardson, Superintendent, Hospital for Insane, Massillon, Ohio:

DEAR SIR: The State Board of Health has considered your application for approval of plans for a water supply for the Hospital for Insane at Massillon, to be obtained from wells 375 feet deep, or thereabouts, located on the grounds of the institution, and you are hereby notified that said source of supply has been approved by the Board.

(Signed) Yours truly,
By order of the Board. C. O. PROBST, M. D.,
Secretary.

REPORT ON THE PROPOSED WATER SUPPLY FOR MINERAL POINT.

To the State Board of Health:

GENTLEMEN: At your request I visited Mineral Point August 31, for the purpose of examining the proposed sources of public water supply. These sources are three springs, about 50 rods apart, and all issuing from points near the bases of rather precipitious hills The springs are in a rather sparsely settled farming district, and are about a mile from the village, and about 85 feet above the level of the central and most important street. It is proposed to conduct the water to a point near the village by gravity, and to store the same in a reservoir on one of the high points that surround the village site. It is estimated that the springs are adequate, by the help of impounding, to furnish the present needed supply. If additional water should be needed the proposed conduit is in the direction of the Sandy valley where water is said to be in abundant quantity.

I took samples of the water from each spring, marking the same "Upper Spring," "Lower Spring" and "Mine Spring," and sent the same to Dr. Probst for examination. I have received the chemist's report which is as follows:

SEPTEMBER 7, 1898.

Mineral Point Water. Chemical.

Three samples of water were received from Mr. J. Hartzell on September 2, 1898.

	Upper Spring.	Lower Spring.	Mine Spring.
Color	.05	.05	.05
Turbidity	None	None	None
Sediment	None	Very slight trace	Very slight trace
Odor	None	None	None

PARTS PER MILLION.

	Upper Spring.	Lower Spring.	Mine Spring.
Oxygen required	.739	.864	.762
Nitrogen as free ammonia	.005	.005	.005
Nitrogen as albuminoid ammonia	.008	.036	.046
Nitrogen as nitrates	none	6.216	none
Nitrogen as nitrites	none	.0012	none
Chlorine	3.03	3 21	2.89
Temporary hardness	12.2	14.4	27.2
Permanent "	10 7	12.4	19 4
Total solids	93.	112.	108.
Loss on ignition	25.	29.	42.

The analyses show the waters from the "Upper Spring" and the "Mine Spring" to be without objection as sources for a public supply.

In the sample from the "Lower Spring" was found a very small amount of nitrogen as nitrites and a high amount of nitrogen as nitrates. The waters are so similar in all other respects that one would desire to know the origin of this nitrogen, although it is in that stage of purification which is least objectionable. The analysis indicates that it is not of recent origin and not from animal source. If the jug in which the sample was collected was free from nitrates, I would expect that the water had washed soil upon which the organic matter had fallen so long ago that it had been completely oxidized and was now in mineral form.

(Signed) E. G. HORTON.

I took some pains to have clean jugs. I may add, incidentally, that in the picturesque sense, I have never seen such beautiful springs. They have a very enviable reputation and, in view of the chemist's report, I recommend approval for the proposed water supply for Mineral Point.

JOSIAH HARTZELL,
Committee.

September 13, 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, September 19, 1898.

To the Mayor and Council, Mineral Point, Ohio:

DEAR SIRS: The State Board of Health has considered your application for approval of a public water supply to be taken from three springs, situated about one mile from the village, and known as "Upper Spring," "Lower Spring" and "Mine Spring."

You are hereby notified that such sources of public supply have been approved by the Board.

Yours truly,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON PROPOSED WATER SUPPLY FOR MINGO JUNCTION.

To the State Board of Health:

GENTLEMEN: In response to a letter, I visited Mingo Junction, July 5, 1898, to inspect proposed plans for water supply. I found nothing but a verbal description and the site of the proposed plant. I advised that the plans and specifications were necessary and must be filed before we could take any action.

Mingo Junction is a furnace town, three miles below Steubenville on the bluff banks of the river, with a population of 2,500, growing slowly. The people are now dependent upon wells and springs for water, and that such supply is not wholesome seems to be indicated by an unusual amount of typhoid. The town is not sewered and is not likely to be for sometime.

The proposed plant is to be constructed by a private company and the plans and specifications are herewith submitted:

The water is to be taken from a crib placed under the bed of the Ohio river, called a filtering crib. Its length is 40 feet, width eight feet, and depth four feet, built of 10-inch plank, two inches thick, laid flat with cross plank every eight feet, all thoroughly spiked together and covered on top with a double deck of plank, the bottom being left open. The cross planking each eight feet will leave the inside of crib divided into six sections, all however connecting together by the slots left between planks. The top of the crib, will be, of course, sealed tight and sides and ends slotted by the cross partitions.

This crib will be sunk under the bed of the river, a dredge-boat making excavation in the gravel sufficiently deep to receive it and allow for six feet of gravel covering over the crib when sunk in position. Before sinking, the eight-inch suction pipe will be run into the side of the crib 18 inches below the top and a trench dredged from shore to the middle of crib excavation. The crib being placed up and down the river will then be weighted with stone, the suction pipe of wrought iron being all screwed together will then sink with the crib to its position in trench. The dredge-boat will cover crib and pipe with the gravel taken out and the crib will be ready for use.

The pump station will be located on the river bank; building of brick 30 by 50 feet in dimensions, containing the engine to drive the pump. The pump will be a Deming triple power pump, of a capacity of 350 gallons per minute, and will be located in a dry well, 24 feet deep and 20 feet in diameter, constructed at the river end of the building. Pump to be connected to engine overhead by a belt using a friction clutch for starting or stopping said pump. The well will be brick and cemented, grouted, etc., making it water-tight, and is large enough for a second pump, should it be needed in the future.

The rising main from the pump station will be eight-inch, extending 6,400 feet to the reservoir, 270 feet above the river. (Aneroid barometer measure). From this the water will be distributed by eight, six, and four-inch pipes through the various streets of the town.

The reservoir will be 60 feet in diameter, round, with perpendicular walls like a well and 20 feet deep; walled with 13-inch brick walls, well grouted, and lined with Portland cement. Bottom concreted and cemented over the natural stone formation.

At the pump station, a four-inch blow-off line will be connected around the pump with the rising main and suction line and a valve on this will control the pressure. This to be used in case of sand getting in suction line, the reservoir pressure would drive it out clean. A six-inch safety valve will also be placed on the rising main to avoid any possible danger of bursting the line or breaking the pump in case of stoppage of pipe by valves or from any other cause. While there is hardly any possibility of this ever being used, it is deemed a wise precaution to put it on.

I enclose the letter of application and explanation from the attorney of the Water Works Company:

PITTSBURGH, PA., June 15, 1898.

To the State Board of Health, Columbus, Ohio:

GENTLEMEN: As attorney for Mingo Junction Water Company, a company which is about to be incorporated under the laws of Ohio for the purpose of supplying water to the village of Mingo Junction, Jefferson county, I write to advise you as to the location of our pumping station and source of water supply. Owing to the way land lies at Mingo, it will be necessary to locate the pumping station at about the center of the town. Our method of obtaining water, however, is such that no inconvenience can possibly result from such location. We sink a crib under the channel of the river, covered with at least six feet of gravel. The excavation will be 15 feet deep, and the crib will be 40 feet by 8 feet by 4 feet. It will be tightly closed at the top, and the water forced through the bottom by suction. This is the system used at Sewickley and at Edgeworth, which is just below Pittsburgh. The several members of our company are interested in the latter water works, and have been using this system. The water there is far better than the water pumped into the Pittsburgh mains, and the chemist's report shows the bacteria of the water almost entirely eliminated. As a test of the success of the system at that point, an analysis of the water was made in September, when the river was at its lowest point. The water in the river itself, which flowed over the crib, showed 4,600 families of bacteria per cubic centimeter, while that taken from the reservoir after this process of filtration, showed only 16 families of bacteria per cubic centimeter. This analysis was made by the Pittsburgh Testing Laboratory.

The streets of Mingo Junction have not yet been sewered, but the lay of the town is such that the sewage can, and no doubt will, be emptied below. However, the results of our system have been such, that with our crib sunken deep under the gravel in the middle of the stream, there can be no possibility of sewage, or foreign matter of any kind, entering the water which goes to the reservoir.

Kindly advise me whether this report meets with your approval, and we shall be glad to receive any suggestions which you may desire to make.

Yours very truly,

(Signed) BENJAMIN. L. HIRSHFIELD.

I would respectfully recommend that the proposed plant be approved on condition that the water proves satisfactory to us.

Respectfully,

THOMAS C. HOOVER.
Committee.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, July 28, 1898.

Benjamin L. Hirshfield, Esq., Pittsburgh, Pa.:

DEAR SIR: The State Board of Health has considered your application for approval of a public water supply for the village of Mingo Junction, the supply to be taken from a crib placed under the bed of the Ohio river. The Board has approved the plans for the construction of these works, but reserves the right to condemn the water supply if, after construction, proper examinations should show that the filtration is imperfect and the water not of good quality.

Yours truly,

C. O. PROBST,
(Signed) *Secretary.*
By order of the Board.

REPORT ON PROPOSED WATER SUPPLY FOR MT. GILEAD.

At the request of the committee on water supply of the council of Mt. Gilead, I visited that place on May 22, 1898, to inspect the source of a proposed public water supply.

Mt. Gilead is the county seat of Morrow county. It numbers about 1,800 inhabitants.

It is proposed to obtain a water supply from wells located in a narrow, flat valley northwest of the village, inside the corporation, and near the station of the T. & O. C. Railroad. A well 15 inches in diameter and 12 feet deep has been bored at this place and lined with sewer tile. The geological formation is as follows:

Loam	1½ feet.
Yellow clay	8 "
Gravel	2 "
Hard-pan	40 "

The water is found in the two feet of gravel between the clay and hard-pan. This well was pumped dry by the fire engine in a few minutes. It was stated by a member of the committee which located the well, that the tile extended down to the hard-pan, shutting off the flow of water, and for that reason the test with the fire engine was not a fair one. It is not likely, however, that this two feet of water-bearing gravel will afford a large quantity of water. This gravel layer seems to terminate a few hundred feet southwest of the well, for in sinking a well at this place it was not found, and no water was obtained.

But aside from the question of quantity, the location of the proposed wells is such, considering their shallowness and surroundings, that there would be considerable danger of their pollution. The sole reason assigned for selecting this location was that it would lessen the running expenses on account of nearness to a coal railroad.

A sample of water collected at the time of my visit was sent to Prof. N. W. Lord, who reported as follows:

COLUMBUS, OHIO, June 2, 1898.

Dr. C. O. Probst, Secretary State Board of Health, City:

DEAR SIR: Following are results of analysis of sample of water marked "Mt. Gilead, shallow well, May 22, 1898. Proposed for public supply." When the sample came to the laboratory the stopper had come out and a very little of the water had spilled, but not enough to make any difference in the sample, I think.

Water slightly turbid; with a distinct sediment, yellow in color; no odor; and only a trace of *color*, (rated at 0.05.)

	Parts per 100,000
Free ammonia	.0064
Albuminoid ammonia	.0066
Nitrogen as nitrites	.0001
" nitrates	.005
Chlorine	0.25
Oxygen required	0.16
Temporary hardness	27.2
Permanent "	22.4
Total solids	72.5
Volatile solids	8.5

The water is low in organic ingredients and in chlorine. The ammonias are not high. The water is of good quality as far as chemical evidence goes, though the free ammonia is higher than in the purest waters. I should say that if surroundings were satisfactory the water was of good quality.

Respectfully,

(Signed) N. W. LORD.

While the chemical analysis does not indicate present contamination of the water, the barriers against future pollution are so slight that I must recommend that the proposed supply be not approved.

Respectfully,

C. O. PROBST,

Secretary.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, June 30, 1898.

To the Mayor and Council, Mt. Gilead, Ohio:

DEAR SIRS: The State Board of Health has acted upon your application for approval of a public water supply to be secured from shallow wells at the northwest limit of the village and near the station of the T. and O. C. railroad. The Board is of the opinion from the examination that these wells would not afford a water supply at all times safe against pollution and you are hereby notified that said source has been disapproved.

Yours truly,

(Signed) C. O. PROBST.

By order of the Board. *Secretary.*

REPORT ON ADDITIONAL WATER SUPPLY FOR SALEM.

To the State Board of Health:

GENTLEMEN: Being in need of more water the Salem Water Company placed before the Board its application for approval of a plan for obtaining the same. The major portion of the water heretofore supplied has been obtained from several wells located on Garfield avenue, in the heart of the town. The wells are bored, most of their distance through rock, and the water is obtained in sand rock at a depth of a little over 100 feet. The proposed additional supply is another well, similar to those already in use, and about 30 feet distant from them. It is simply an added perforation into the same water-bearing seam. It is already bored, and its water can be added to those already in use by simply opening a valve.

With a view to being informed in regard to the sanitary condition of these waters your committee, appointed June 8, visited Salem June 11, and obtained specimens for chemical and bacteriological examination. Samples marked "A" were taken from the Garfield avenue wells, being the water heretofore supplied to the town. Samples marked "B" were taken, after the new well had been connected with the pump for a short time. The last named samples consisted of a mixture of the waters derived from both the old and new wells—it was impossible to obtain water exclusively from the new well. The results of the chemical and bacteriological analyses are as follows:

Columbus, Ohio, June 28, 1898.

Dr. C. O. Probst, Secretary of State Board of Health:

Dear Sir: Following are the results of analyses of two samples of water maked Salem, Ohio:

Parts per 100,000.

	A	B
Turbidity	very slight	slight
Odor	none	none
Sediment	slight	slight
Oxygen required	0.02	0.03
Free ammonia	.0028	.0036
Albuminoid ammonia	.0016	.0016
Nitrogen as nitrites	none	trace
" nitrates	0 040	0.017
Chlorine	0 35	0.23
Temporary hardness	19.0	19.4
Permanent "	3.6	3.4
Total solids	30.5	30.0
Loss on ignition	3.5	2.0

Marks—"A" Garfield avenue well, new well disconnected. "B" Garfield avenue well, new well connected with pump.

As far as chemical analysis can detect, both these samples are exceptionally free from organic impurity. They certainly have not received any considerable quantity of recent or remote sewage and are of excellent quality.

Very respectfully,

(Signed) N. W. Lord.

Columbus, Ohio, June 18, 1898.

Dr. C. O. Probst, Secretary:

On June 11, I received two samples of water marked respectively "A Salem, new well disconnected." "B Garfield avenue well, new well connected with pumps." No date of collection was given. The samples having been in transit for sometime, no attempt was made at a numerical determination of bacteria. Tests were made as follows, inoculation being made June 14, and results recorded June 17:

"A." 1. Flask of broth+Parietti mixture in incubator (40° C.)—no growth.

2. Agar plate—incubator, no growth.

3. " " " one colony.

4. Agar tube+Parietti mixture in incubator—no growth.

5. Agar tube at room temperature—free growth, both superficial and deep; greenish fluorescence; no odor.

"B." 1. As above—no growth.
2. " " "
3. " " "
4. " " "
5. " " " growth as above.

From these results it appears that these waters are practically identical as to their bacteriological content, and that they do not contain parasitic or fecal bacteria.

Respectfully,
(Signed) A. M. Bleile.

The quality of these waters, as exhibited by these analyses, is quite satisfactory. There are, however, unfortunately, aspects of the sanitary condition at Salem that we must not lose sight of. These involve the annual invasions of typhoid fever by which its community has been afflicted. The extent of these may be apprehended by the following summary of cases, copied from the records of Dr. F. T. Miles, health officer of Salem.

The record of cases from 1890 stands thus:

In 1890	64 cases.
In 1891	59 "
In 1892	38 "
In 1893	111 "
In 1894	103 "
In 1895	30 "
In 1896	19 "
In 1897	64 "

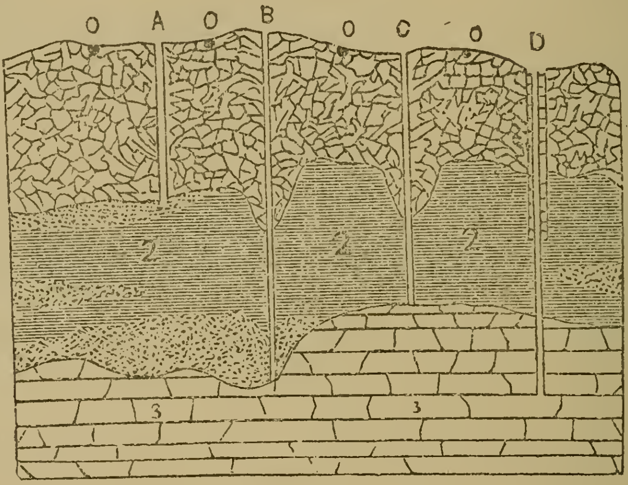
Of the 64 cases in 1897, 43 families used city water and 21 families used well water.

The more specific details of the situation at Salem, to be found in a report to the Ohio State Board of Health, by Dr. Byron Stanton, under date of November 6, 1897, obviate the need of a more extended presentation of this feature of the situation.

These facts show that something is wrong, and radically wrong, at Salem. Typhoid fever is a preventable disease, and is always prevented if the proper precautions are taken. These two propositions cannot be controverted. It is equally incontrovertible that in 99 cases out of 100 the inciting cause of such a prevalence of typhoid fever has been sought, and has been found either in the water or milk supply of the victims, the infected milk also getting its poison from infected water.

We are led to suppose that the quality of the Salem water is variable, changing with meteoric and hydrographic conditions; that when the surface supply sources are abundant, as during the earlier months of the year, it may be comparatively pure, while during the later and dryer months, when the water body is alimented only by the soil drainage, it becomes charged with infection. The fact that the Salem water is pumped from the earth at a point near the center of the city instantly suggests the possibility of fecal contamination.

We were informed by the superintendent of the water works and others that in boring these wells the descent is made, first, through about 15 feet of yellow clay, then through 8 to 10 feet of blue clay or shale, when the rock formation is reached, in which, at a depth of about 60 feet farther, the water is reached. The water covering would therefore be approximately indicated by the following cut:



The yellow clay is indicated by figure "1," the blue clay or shale by figure "2," the rock by figure "3." The first and shallow wells reached water as indicated by "A;" many wells were dug to the rock as shown by "B" and "C;" the water works wells penetrate deeply into the rock as shown at "D." If, when the well "D" is sunk much deeper than the others, it had as a result the emptying or draining of the wells "A," "B" and "C" over a considerable area, then the drainage relations of the one to the other, of the clay and rock waters, would seem to be clearly established. We were informed that such was the actual fact. Under such circumstances, while rains and thaws keep the surface abundantly supplied with water, the waters in the rock seam should exhibit comparative purity. But if rains are denied for a considerable period, and the only subsidence from the surface is from waters that have been used, or fluids that have gone into vaults or depressions, as at "O," "O," then phenomena of sinister import to the health of the users of such water might be apprehended. The periodic and persistent recurrence of typhoid fever at Salem necessitates further investigation. We especially recommend to the Board the propriety of obtaining chemical and bacteriological analyses of these waters during the periods of low water, which generally coincide with fever prevalence.

In view of all the circumstances, your committee recommends the temporary and revocable approval of the new well. If future analyses justify it this approval can be made permanent.

JOSIAH HARTZELL,
BYRON STANTON.
Committee.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, July 20, 1898.

MR. F. W. ALLISON, Superintendent of Water Works, Salem, Ohio:

DEAR SIR: The State Board of Health hss considered your application for the approval of an additional water supply for Salem to be obtained from a well similar to those already in use and about 30 feet distant from them.

You are hereby notified that said additional supply has been temporarily and revocably approved subject to further examination.

Yours truly,
(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON PROPOSED WATER SUPPLY FOR SYCAMORE.

The mayor of Sycamore made application to the Board for its approval of a water supply proposed for that village.

Sycamore is a town of about 800 inhabitants, in Wyandot county.

It is proposed to obtain water from deep wells located at the east boundary of the village, two acres of land having been obtained for the purpose. An eight-inch well has been drilled 185 feet deep. The soil, according to the best information obtainable, consists of clay and some quicksand for a depth of 120 feet. At this depth hard-pan is found with some quicksand under it; limestone being found at 142.5 feet. The water rose to within 23 feet of the surface. The well was pumped for 24 hours, at a rate of 60 gallons per minute. The water is cold and palatable. There are no sources of pollution in the immediate neighborhood, and the depth of the well and character of the soil afford excellent protection against local contamination.

I inspected the well and collected a sample of the water on May 16, 1898, and submitted the sample to Prof. N. W. Lord for analysis, who reported as follows:

Columbus, Ohio, June 2, 1898.

Dr. C. O. Probst, Secretary State Board of Health, City:

Dear Sir: Following are results of analysis of sample of water, marked "Sycamore, May 16,—Deep well." Water turbid, no sediment, slightly oily odor.

	Parts per 100,000.
Free ammonia	.0300
Albuminoid ammonia	.0018
Nitrogen as nitrites	none
" nitrates	none
Chlorine	0.02
Oxygen required	0.06
Temporary hardness	31.6
Permanent "	20.8
Total solids	73.5
Loss on ignition	8.0

The water corresponds in composition to a pure deep well water. It contains considerable free ammonia, as would be expected, but the freedom from albuminoid ammonia, nitrates and nitrites, and the low oxygen requirement show the practical absence of organic matter, and the *low chlorine* shows freedom from remote sewage pollution. I should say the water was of first rate quality. The turbidity is probably due to the oxidation of iron carbonate; I presume the water *as drawn* was clear.

Yours respectfully,

(Signed) N. W. Lord.

I have the honor to recommend that the proposed water supply for Sycamore be approved.

Respectfully,

C. O. Probst,

Secretary.

Ohio State Board of Health,
Office of the Secretary,
Columbus, June 20, 1898.

To the Mayor and Council, Sycamore, Ohio:

Dear Sirs: The State Board of Health has considered your application for approval of a public water supply to be obtained from drilled wells about 185 feet deep and located at the eastern boundary of the village. You are hereby notified that said source of water supply has been approved.

Yours truly,

(Signed) C. O. Probst,
By order of the Board. *Secretary.*

REPORT ON THE WATER SUPPLY OF WADSWORTH.

To the State Board of Health:

GENTLEMEN: The village of Wadsworth has had a public water supply since 1881. The plant was first put in by a stock company composed of the principal citizens of the village, but within the last few years the stock has been bought up by one man, who now has complete control of the water works. There was no franchise granted to the old stock company by the corporation nor has any been granted to the present owner, the consumers having private contracts only.

The first water was taken from three springs, two situated on the hills just north of the village and one on those east, and at an average elevation of 80 feet above the village streets. The springs have been analyzed and their flow increased by cutting out a basin in the bed rock. One of the northern springs has a basin 25 by 30 feet and 10 feet deep, walled up with oak scantling layed horizontally, and covered with a board roof. The walls protect the spring to some extent from surface water but not entirely and offer no protection at all from the water seeping in above the rock. Thirty yards from this spring and on the hill above it, is the dirty yard of a house, where all the slops are thrown. In this yard is an outhouse, provided with a draw box, the box being constructed of planking but not water-tight by any means, and at the time of inspection it was full and just commencing to run over, but with no visible preparations being made to empty it. The filth from this yard and outhouse cannot help from being washed into the spring by every rain, if not directly, it will certainly seep in through the loose soil above the rock. The other spring is 200 yards east of this one and is 16 feet square and about 10 feet deep, also walled with oak scantling and practically covered with a board roof. This spring is about 100 yards from a large barn but not in direct line of the surface wash from it.

The third spring, known as Baughman's spring, is one-fourth mile east of the last corporation line of the village. Its basin is 18 feet square and is cut into the hillside rock. The back of the basin has a rough stone wall to keep the hill from sliding into the spring, but the other sides have no protection at all. This spring is completely covered with a board roof. On the hill above the spring, and 100 yards distant from it, there is a large barn, hog pens and stable yard, all in a very filthy condition Immediately surrounding the spring is a pasture in which several hogs were feeding. A lane leads from the barn yard down through the pasture and past the spring and serves as a channel for all the dirt of the yard to wash down into the spring.

These springs soon failed to give water enough and resort, it is said, had to be made to a couple of ponds to help supply the deficiency, but these are drained now and no water can be taken from them. In the spring of 1898, three wells, six inches in diameter and 40 feet deep were drilled. The wells are 50 feet apart and strike the rock 12 feet below the surface. The wells and ponds mentioned above are in the western part of the village, in the valley of a small run. The suction pipe of wells is fastened direct to the casing and no surface water can get in. The water rises to the top of two of the wells and flows a little from the third, but this is due to the different heights of the outlets and not to a different water pressure.

The wells are pumped by a small 150,000-gallon Worthington pump. This pump lowers the wells 15 feet and holds them at that level easily but as soon as the pumping stops the water rises to its original height. The discharge pipe from the pump is connected to the city mains and any surplus water is forced back into the spring basins which act as small reservoirs. The wells are pumped only when necessary, usually one or two days a week, just whenever the springs run low. No estimate could be had as to the amount the springs furnish and none as regards the total amount of water supplied the village.

There are 200 water takers, but all these do not use it for domestic purposes, there being some 100 wells in town still in use. Probably one-half the village must depend upon the public water for domestic purposes. The private wells are nearly all dug, and are from 15 to 40 feet deep, very few of them reaching the Berea sandstone, which forms the bed rock for this vicinity.

The water works company has no fixed rates, charging about $6 per annum for private houses, and $1 each for baths and stables and allowing free sprinkling.

There are only two sewers in town, each about two blocks long. One of these has four closet connections and the other none, the sewers being used mainly for storm water and for yard drains. Both sewers empty into small runs which flow into the Salt Works' pond. This pond water after being used in the manufacture of salt, finds its way into the Tuscarawas river. The small creeks as they flow through the lower part of the village are objectionable to a slight degree from the large amount of wash water and slop, smelling pretty strong in the hot sun.

Respectfully submitted,

B. H. Flynn, C. E.

September 7, 1898.

REPORT UPON PROPOSED WATER SUPPLY FOR WELLINGTON.

WELLINGTON, OHIO, April 20, 1898.

To the Honorable State Board of Health, Columbus, Ohio:

GENTLEMEN: The village of Wellington, Ohio, by its council is about to construct a system of electric lights, and in connection therewith desires to construct a system of water works to be used for fire, street, and manufacturing exclusively, and in nowise for domestic use. The water will be obtained from surface drainage of farm lands, and stored in a large reservoir built for that purpose. We therefore petition your honorable body to grant us your approval for the construction of said system of water works in accordance with the above mentioned facts and uses.

Yours respectfully,

(Signed) GEORGE L. COUCH,
Mayor.

F. A. CHAPMAN,
Clerk.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, April 27, 1898.

Mr. George L. Couch, Mayor, Wellington, Ohio:

DEAR SIR: The State Board of Health has considered your application for the approval of a public water supply to be obtained from surface drainage of farm lands, and stored in a reservoir built for that purpose; the supply to be used exclusively for fire, street and manufacturing purposes.

You are hereby notified that the proposed supply has been approved by the Board subject to the condition that it shall not be used for domestic purposes, and that an ordinance be passed by your village council prohibiting its use for domestic purposes.

This approval is to remain null and void until after the receipt of a certified copy of such an ordinance.

Yours truly,

(Signed) C. O. PROBST,
Secretary.

By order of the Board.

SEWERAGE SYSTEMS AND SEWAGE DISPOSAL WORKS.

PROPOSED PLANS FOR SEWAGE DISPOSAL FOR CLYDE.

The Honorable State Board of Health:

GENTLEMEN: We respectfully submit herewith plans and specifications for proposed plant for purification of the sewage of the village of Clyde, Ohio.

Clyde with a population of about three thousand (3,000) people has a sewerage system about two miles in extent. Of this amount there is about three-fourths ($\frac{3}{4}$) of a mile of outlet sewer having no sanitary taps. The main and branch sewers have about eighty (80) taps and accommodate an estimated number of about five hundred (500) people.

During the dry summer months Raccoon creek, into which the main sewer empties, does not have a flow of water to sufficiently dilute the sewage. This makes it necessary for the village to put into operation a plant for the purification, during the summer months, of the city sewage.

The plan adopted as best for present needs and for sometime to come has been that of intermittent filtration, and for this purpose the council of the village purchased about twenty (20) acres of land lying north of the Western Reserve and Maumee turnpike and on both banks of Raccoon creek, below the mouth of the present sewer.

The portion of this land selected for the present purpose is an area of about three (3) acres lying on the east bank of the creek and about seven hundred (700) feet northeast of the mouth of the old sewer.

The nearest dwellings to this location are one house about forty (40) rods northwest and one about forty (40) rods southeast.

The soil on this land is rather irregular in composition, consisting of silt deposits from changes in creek channel and a sandy loam mixture with more or less quicksand washed in from the country above, which has a good deal of soil of this kind.

In order to get the proper elevation for the distribution sewer we intercept the old sewer at a point one hundred (100) feet west of Vine street. This intercepter is so constructed that the surface water, in times of heavy storms, etc., will pass down the old sewer which will be used as a storm overflow. From this point we have an elevation sufficient to carry the sewage not only to the present beds but to carry across the creek for distribution on future beds, and also to allow the thickness of the present beds to be increased from three (3) to four (4) feet should it prove necessary in order to secure the proper working of the beds.

It is proposed to keep the beds graded and at a proper level to obtain the best results in properly distributing the sewage to parts of the beds.

To avoid any sludge there will be placed in the old sewer at a point above the intercepter a fine screen which will be properly cleaned.

The area of filtration, exclusive of embankments, is about three (3) and one-fourth (¼) acres which is divided into six beds; the thickness of beds above top of drain tile is three (3) feet and as above mentioned can be increased to (4).

Wishing to have the plant in operation at the earliest possible date, we trust that your honorable body may be able to give us an answer at the earliest convenient time.

Respectfully submitted,

(Signed) H. O. DUTTER.
Clyde, Ohio, August 17, 1898. *City Engineer.*

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, September 8, 1898.

Mr. H. O. Dutter, City Engineer, Clyde, Ohio:

DEAR SIR: The State Board of Health has considered plans and specifications filed for the purification of the sewage of the village of Clyde, and you are hereby notified that said plans and specifications have been approved. It is advised, however, that the underdrains should be located not more than fifteen (15) feet apart; that extra care be exercised in grading the surfaces of the beds in order that there should be no ponding of the sewage. The Board reserves the right to order such extensions to the filtration area, or such other changes as it may deem necessary, should it be demonstrated, after the proposed plans have been carried out, that the sewage is not properly purified.

Yours truly,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON A SYSTEM OF SEWERAGE AND SEWAGE DISPOSAL PROPOSED FOR THE VILLAGE OF EAST CLEVELAND.

To the State Board of Health :

Gentlemen: The village of East Cleveland is a suburb of Cleveland. The question of sewerage has been under discussion for sometime, and the need for sewerage facilities has become very great. The village is something over a mile from the shore of Lake Erie, and the only outlet for sewage is a small creek, often dry in summer. This creek flows through fine residence property; and it will be necessary to purify the sewage to the highest possible degree to permit of this creek being used as an outlet for sewage, if a nuisance is to be avoided. If chemical precipitation works were introduced, the effluent would have to receive still further treatment by some form of filtration. The land available is not suitable, apparently, for purification by intermittent filtration, so that artificial beds would be required for sewage purification in this manner.

The plan proposed for the purification of the sewage is by filtering through coke subjected to forced aeration. Following is a description of the plant proposed for East Cleveland, furnished by Walter P. Rice and F. C. Williams, as consulting engineers for the village: "The initial unit is to have a capacity adequate to the complete purification to a 90 per cent. standard of 150,000 gallons per day of 24 hours. It is proposed to add further and similar units from time to time as the growth of the community may demand.

The above unit contains six strainers, of which four are down flow and two are up-flow, one of the latter serving two of the former. The down-flow beds are rotated in service for equal periods, the period of aeration being necessarily three times as long as the period of charging. The up-flow beds are also alternated, but their periods of changing and aeration are equal, the amount of accumulated matter being very small. Each strainer bed contains substantially 600 square feet of area, making an aggregate of 3,600 square feet in all, with 1,200 square feet in service at any moment.

All the strainer beds are filled to a depth of two feet and six inches over the hollow floor with coarse material, such as pebble, broken stone, crushed slag, etc. It is not intended that these fragments act as a strainer in any mechanical sense, and the voids between them are purposely left large. Their office is to present a large surface on which the solid matter may slowly precipitate as a slime, and on which the scavenger bacteria may find an extended area for their active work, with favorable conditions for their preservation during the dormant state.

Following the strainers is an aerator presenting a total surface of substantially 6,000 square feet. Operatively this is a single bed, but for convenience in raking and for constructive considerations it is divided into four long and narrow beds. The whole aerator is continuous in its action, however, as it is never drowned, but the rate of flow per square foot is so slow that the clarified sewage merely trickles down through the filling material in an exceedingly thin film. The rate of flow is practically one gallon per square foot per hour.

The filling material may be coke, pebble, broken stone, crushed slag, cinder, or any suitable material presenting large and rough surfaces so as to mechanically retard the flow. The preferred sizes are from three-fourths inch and smaller. The depth of the filling material over the floor of hollow tile is in this case five feet.

A fan blower is provided of sufficient capacity to supply a pressure of four ounces throughout the hollow floor under all the beds. In the strainers the act of draining automatically admits the air which continues to be supplied till the readmission of the sewage automatically cuts it off. During this time the last vestige of slime will have disappeared.

In the aerators, the action of the air is without interruption, not only stimulating an intense bacterial activity, but checking the flow of sewage through the beds so as to increase the time during which it is submitted to bacterial action about threefold. The combination of the thin film, the enormous surface, the high spontaneous temperature, and the extended time, serves to create conditions under which the bacteria will remove practically all of the organic matter remaining in solution."

It will be especially noted that in the presence of an excess of oxygen, no putrefaction is possible.

It is proposed to place this plant in a ten-acre field, acquired by the village for sewage disposal purposes. The effluent from the works will be discharged into Shaw creek at the place where it crosses Hayden avenue. It is about one and one-half miles from this point, by way of the creek to Lake Erie. The mouth of this creek is about one mile west of the point in Lake Erie selected by the city of Cleveland as the place of discharge for the intercepting sewer now being built.

This plan proposed for the purification of the sewage of East Cleveland, is comparatively new, though not wholly untried, the most conspicuous example being found at Willow Grove Park near Philadelphia. This plant was inspected by representatives of East Cleveland before recommending the adoption of this plan of sewage disposal.

Sections 6 and 7 of the specifications for the construction of the purification works are as follows:

6. Said plant shall consume all of its own sludge within the limits of the plant itself, without mechanical removal from or disturbance in the place of its original deposit, and without the addition or use of chemical reagents. Both the apparatus and its material shall be such as to be adequatly cleansed by exposure to the action of air alone, and without removal for that purpose.

7. The final effluent shall be free from suspended organic matter and shall be substantially without color, odor, or taste, and shall show upon analysis the removal of at least 90 per cent. of the organic matter both solid and soluble originally in the crude sewage.

It is the understanding of the representatives of the village and of the engineers in charge of the work, "that 90 per cent of the organic matter both solid and soluble originally in the crude sewage," given in section 7, refers to living as well as dead organic matter.

We recommend that this section be so amended as to state this clearly.

The sewerage system is to be on the separate plan, with a 20-inch outlet. It will provide sewerage for all the territory of the corporation with the exception of a small and unimportant portion of it. The plans show that it is to be constructed along the lines of modern sewerage requirements.

We recommend that the plans as presented for a sewerage system and sewage purification works for the village of East Cleveland be approved.

JOSIAH HARTZELL,
WM T. MILLER,
C. O. PROBST,
Committee.

October 24 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, Nov. 14, 1898.

To the Mayor and Council, East Cleveland, Ohio:

DEAR SIRS: The State Board of Health has considered your application and plans, as submitted by The Walter P. Rice Engineering Company, of Cleveland, for the purification of the sewage of the village of East Cleveland, Ohio, and you are hereby notified that the plans have been approved.

The Board would urge, however, that, in view of the fact that this system of sewage purification has been in use in other places but a comparatively short time, a satisfactory guarantee be obtained as to the results, both from a chemical and bacteriological standpoint.

Yours truly,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON PROPOSED ADDITIONAL SEWERAGE FOR EAST LIVERPOOL.

To the State Board of Health:

Gentlemen: The city of East Liverpool having made application for approval by the Board of plans for additional sewerage (Sewer District No. 2), I visited that place, March 4, 1898, inspected the plans and location of the outlet sewer, and beg leave to report as follows:

East Liverpool is located on the Ohio river in Columbiana county about 45 miles below the city of Pittsburgh. Four miles below is Wellsville with an estimated population of 7,000. Fourteen miles below is Toronto with an estimated population of 5,000; 21 miles below is Steubenville, a city with 14,500 inhabitants (estimated) and 42 miles below are Martin's Ferry and Bridgeport (practically one city) with an estimated population of 14,000, and 47 miles below is Bellaire with 12,000 inhabitants. All of these cities, with an aggregate populatian of 52,500 depend almost entirely on the Ohio river for a water supply.

East Liverpool is a rapidly growing city with a present estimated population of 15,000. A separate system of sewerage was introduced in 1888 providing for Sewer District No. 1, embracing most of the business part of the town. This sewer is about 12 to 13 miles in length and discharges by a 10-inch main into the Ohio river at the foot of Union street. It provides sewerage for from 5,000 to 6,000 people. Sewer District No. 2 will serve about the same number of people. It will also be on the separate system plan with a 12-inch outlet, which is to be brought down a ravine at the lower part of the town, and will be extended by an iron pipe several hundred feet from ordinary shore line, and always beyond low water mark. The outlets of the two sewer districts will be about three fourths of a mile apart. Should it ever become necessary, sewage from District No. 1 can be brought to the outlet proposed for District No. 2. The country about East Liverpool is quite hilly, the hills approaching close to the river. No land, apparently, is available for purification of sewage by irrigation or filtration. Chemical precipitation works could be used, but the effluent from such works cannot be safely turned into streams affording public water supplies below.

This most difficult problem of dealing with the pollution of interstate streams, is thus brought squarely before the Board. The sewage of an urban population of about 1,000,610 is cast into the Ohio river before it reaches this state. In Ohio more or less sewage is discharged into it by the following places: East Liverpool, Wellsville, Toronto, Steubenville, Martin's Ferry, Bridgeport, Bellaire, Marietta, Pomeroy, Middleport, Gallipolis, Ironton, Portsmouth and Cincinnati. Several important cities in West Virginia and Kentucky turn their sewage into this river, so that, when the river leaves Ohio at the Indiana line it has received, directly or indirectly, the sewage of an urban population of 2,453,339. Even if the sewage of all Ohio towns were kept out of the river, it would still be polluted to an extent to make it, in its raw state, an unsafe source of drinking water.

East Liverpool, it should have been stated, obtains its water supply from the Ohio river some distance above the outlet of Sewer District No. 1.

While not advocating the continued use of the Ohio river for the removal of the sewage of towns along its banks, the only apparent solution to this question seems to be that its waters must be purified before being used for domestic purposes. Cincinnati is setting an example which will have to be followed by other places obliged to resort to the Ohio river for a water supply. This city expects to obtain water from the Ohio river fully 100 miles below where sewage of any amount enters it; and the river at this place is probably at its maximum purity. But Cincinnati will filter its new water supply.

American cities must come more and more to the European view that streams draining populous territories are *dirty* and must be cleaned (filtered) before being used for water supplies.

Recognizing the violation of sanitary principles involved, I still see no other way than to recommend, which I hereby respectfully do, that the plans for Sewer District No. 2 of East Liverpool, be approved.

At the same time I would recommend that the suggestion be made to the authorities of East Liverpool and Wellsville that they take under serious consideration the advisability of joining in a scheme for the purification, by one plant, of the water supply of both places.

Respectfully submitted,

C. O. PROBST,
Secretary.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, March 18, 1898.

Mr. J. N. Hanley, City Clerk, East Liverpool, Ohio:

DEAR SIR: The State Board of Health has considered your application for approval of plans for Sewer District No. 2, with an outlet sewer discharging into the Ohio river at the point shown on the map furnished by your engineer. You are hereby notified that said plans have been approved by the Board.

Your attention is respectfully called to the recommendation contained in the Secretary's report, a copy of which is enclosed herewith, and which is endorsed by the Board, viz.: That the cities of East Liverpool and Wellsville consider the advisability of joining in a scheme for purifying the water supplies of both cities.

Respectfully,
(Signed) C. O. PROBST.
By order of the Board. *Secretary.*

REPORT ON FOSTORIA SEWAGE DISPOSAL PLANT.

To the State Board of Health:

GENTLEMEN: The plans for the sewage disposal plant at Fostoria as submitted by John P. Force, C. E., and approved by the State Board of Health are briefly as follows:

The sewage was to be received in a small gate chamber provided with a screen to remove coarse matters, then passed to a large settling tank, where the heaviest particles would settle out; the liquid sewage flowing over a weir to the pump well, from which it was to be pumped to the filter beds. These beds were to contain 18 acres in 19 beds, but only 10½ acres were recommended to be built for the present.

The sludge formed in the two settling tanks was to be drawn off to a sludge well and from there to be pumped to a filter press and the sludge cakes to be burned in a crematory, if they cannot be disposed of otherwise. The crematory was part of the original plan and was to handle night soil and garbage as well as sludge. These plans were adopted by the Sewer Committee of Fostoria and approved by the city council in 1895. It is claimed now that the city never intended to build the works, but that the plans were adopted in order to pacify the farmers along the east branch of the Portage river, who were complaining about the nuisance caused by the sewage. Work was started but owing to the local opposition to the plant, it was very much delayed and much time and money wasted.

Up to this time the approved plans have been followed in the main. The gate chamber is built but the screen has not been put in yet. The settling tanks have been built, but, owing to poor work done by the contractor, they are not water-tight and a large amount of ground water leaks in, which will have to be handled as sewage. No sludge well is constructed yet, nor does the sewer committee intend to construct any; but to handle sewage by one pump and not to allow any separation. The committee has contracted for a gasoline engine and a centrifugal pump which were to be in place August 20. The centrifugal pump is to be placed down in the tanks and pump the sewage onto the beds, not allowing any separation of the sludge. This is a radical departure from the plans, as they called for a separate disposition of the sludge and did not attempt to dispose of it upon the beds, as the engineer did not deem it feasible. The pump is built, but of much cheaper design than called for. The full acreage of beds has been put in, but in nine (9) beds instead of nineteen (19), making each bed much larger. Two (2) of the beds have been excavated and filled with sand and gravel, while the others are the original soil except around the underdrains, which are to be covered with sand and gravel.

No crematory is as yet built nor does the committee intend to build any, claiming it to be a useless waste of money, as the centrifugal pump will not allow any sludge to be formed.

Most of the piping and drains seem to be in as designed except the sludge well connections. The beds are not all completed and the embankments will have to be repaired and built up. The city has just appointed a man to take care of the place and he is attempting to fix it up some, but knows nothing about the plant as yet; in fact, no one in Fostoria knows anything about it since the consulting engineer was discharged.

The city was bonded for thirty thousand dollars ($30,000), of which twenty-four thousand ($24,000) have already been spent, and they are now spending more on the centrifugal pump experiment.

The east branch of the Portage river, into which the raw sewage at present enters, is in a very bad condition. It winds in and out through flat mud bottoms, depositing its sewage into every pool, causing a great nuisance to the farmers along its banks. It goes dry in the dry season, except for the sewage which it carries. The local gas plant empties all of its waste into the creek and this covers it with a black, foul-smelling scum consisting principally of the waste oil and lamp black.

Respectfully submitted,

August 11, 1898. B. H. Flynn, C. E.

SPECIFICATIONS FOR SEWAGE DISPOSAL BEDS FOR COTTAGE FOR INSANE, OHIO HOSPITAL FOR EPILEPTICS, GALLIPOLIS.

The building for which this sewage disposal bed is intended, has a capacity of 200 patients. It is situated on rising ground at the head of a valley having an average width of 4,500 feet. This is situated 1,600 feet from the plateau occupied by the other buildings of the hospital, and separated from it by a ravine.

The sewage disposal bed is to be located in this valley at a point commencing 700 feet from the building from which the sewage is to be derived. The sewage is taken from the building through an eight-inch vitrified sewer pipe, carried into a flush tank through a wire basket which will intercept the coarser particles. The flush tank will have a capacity of 10,000 gallons. It will be constructed of brick, laid in grouting and thoroughly cemented. It will have an automatic arrangement for discharging intermittently. The sewage is to be conducted from this through an eight-inch vitrified sewer pipe, to the sewage disposal bed. The sewage disposal bed is to be 300 feet by 116 feet. It is to be laid out in trenches three feet wide by four feet deep, which will be filled with sand. These trenches are to be 10 feet apart, and to extend the full length of the disposal bed. It is to be underdrained by soft tile four inches in diameter, laid at intervals of every 20 feet. The main carrier is to be constructed of split tile, arranged with two gates at the opening of each trench, so that the sewage may be conducted into any trench that may be desired. The sides of the earth beds are beveled toward the trenches so that a certain amount of the sewage may be absorbed by the th, which will be kept loose by constant cultivation.

Ohio State Board of Health,
Office of the Secretary,
Columbus, January 24, 1898.

Dr. H. C. Rutter, Manager, Hospital for Epileptics, Gallipolis, Ohio:

Dear Sir: The State Board of Health has considered your application for approval of plans for disposing of the sewage from the new cottage for insane, by intermittent filtration in accordance with plans and specifications submitted by you, and you are hereby notified that said plans and specifications have been approved.

Yours truly,

(Signed) C. O. Probst,
Secretary.

By order of the Board.

APPROVAL OF A SEWER FOR GORDON PARK AVENUE, CLEVELAND.

Cleveland, June 8, 1898.

To the State Board of Health of Ohio:

Gentlemen: The Board of Park Commissioners of Cleveland, Ohio, hereby ask permission of your honorably body to construct and maintain a sewer in Gordon Park avenue of said city, the outlet of same to be into Lake Erie, it being distinctly understood and agreed that when the proposed intercepting sewer is built by the city of Cleveland, according to plans already approved by your Board, all house sewage will be directed from the Gordon Park avenue sewer and emptied into the said intercepting sewer.

The Board of Park Commissioners of Cleveland, O.
By C. W. Pratt, Jr., *Chief Engineer.*

At a meeting of the State Board of Health, held in the city of Cleveland, June 8, representatives of the Board of Park Commissioners of that city appeared before the Board and asked for the approval of a sewer in Gordon Park avenue, as noted above.

It was voted by the Board to approve the outlet of said sewer as requested.

REPORT ON SEWERAGE PROPOSED FOR LAKEWOOD.

To the State Board of Health:

GENTLEMEN: I was requested by the president to confer with Mr. Rice, a civil engineer of Cleveland, concerning a new system of sewerage for Lakewood, a hamlet adjacent to Cleveland.

He had no plans prepared, but wanted an opinion of the Board with reference to the emptying of raw sewage into the lake. I told him that the Board could only act upon plans and specifications submitted in writing, but that speaking unofficially, but with a knowledge of the sentiments of the Board on this subject, I should say that such plans would be disapproved.

At his request, I communicated this unofficial opinion to the mayor of the hamlet. After some thought upon the subject, the mayor concluded that an official action of the Board would be better, and, at his direction, Mr. Rice presents the accompanying rather crude plans. At a glance it will be seen that the same evils, but in a magnified form, would attend the emptying of raw sewage at the point contemplated in the plans, that the Board considered in the Glenville case.

The movement of the currents of the lake along our shore is northeast, and would tend to convey the sewage almost directly to the intake of the new water works crib for Cleveland.

I would, therefore, recommend that the Board disapprove of any plan that contemplates the emptying of raw sewage into Lake Erie at any point adjacent to the city of Cleveland.

WM. T. MILLER,
Committee.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, December 31, 1897.

Mr. U. W. Hird, Clerk of the Hamlet of Lakewood, Ohio:

DEAR SIR: The State Board of Health has considered your application for approval of plans for a system of sewerage for the hamlet of Lakewood, with outlet at Summit street, and you are hereby notified that the plans and outlet have been disapproved by the Board.

Yours truly,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT UPON A PROPOSED SEWERAGE SYSTEM FOR LEBANON.

To the State Board of Health:

Gentlemen: I have the honor to present the following report upon the proposed system of sewers for Lebanon:

It being necessary to provide immediate drainage for the cellars near the business center of the town, the council has caused to be prepared and has approved a system of sewers, only so much of which will be built now as will meet the present emergency caused by the local board of health ordering the cellars drained, *i. e.*, that part on Mulberry street from the corner of Mechanic street to Alley C., a distance of about 1,000 feet, to be continued by a six-inch pipe to the north branch of Turtle creek until the trunk sewer is completed. It is deemed advisable by the council to so construct that part that it may be incorporated with the general sewer system when completed. In passing, therefore, upon what is now proposed, the entire system must be considered.

Lebanon is divided near its western limits into two parts by the north branch of Turtle creek, a tributary of the Little Miami. The sewers, which are to be used for sanitary purposes only, will generally follow the streets running east and west to a trunk sewer to be built in Alley C., which runs in a north and south direction near to and parallel with the north branch. This trunk line will be about three squares in length and receive the sewage from the laterals.

It is proposed to discharge the sewage from the trunk sewer into the north branch about 330 feet above its confluence with Turtle creek, at point A. North branch at all times contains some running water, but the quantity is so small in dry seasons that there is a possibility that the sewage may not be sufficiently diluted to prevent its becoming a nuisance.

The reasons given for selecting this point of discharge are stated in the application of the engineer and committee of council as follows:

"The point A is selected as an outlet because—

First. It is the low point for the district drained.

Second. It is considered improbable that any discharge of sewage at this point will ever become a nuisance on account of proximity to dwellings here or below.

Third. Since the introduction of water works there is a constant flow of water at this point, which will serve to dilute and carry away sewage. This flow is likely to increase as rapidly as the sewage.

Fourth. If, in the course of time, it should become necessary to carry the trunk line further down the valley, or to dispose of the sewage by other means, this point would still be the proper course for the system."

To the second and third propositions I think exceptions may be taken. I think it is not improbable that a nuisance might be created by the discharge of sewage into a stream that is at times so nearly dry, and it is a question whether the flow in the creek is likely to increase as rapidly as the sewage.

Beyond the statement that "the sewers are, when built, to accord with plans and specifications to be furnished by council, which will include proper appliances for flushing, examination and cleaning," and the verbal statement of the engineer that they are to be of vitrified sewer pipe, no details are given. No plan of sewage purification is at present contemplated, though, if contemplated, it would not change the proposed system, as any purification would have to be done at a point below the proposed outlet.

I would recommend that the request of council to build the part of the sewer now contemplated be granted, and that the continuance of the sewer directly to north branch with a six-inch pipe be permitted so long as the sewer is not used for any other purpose than the drainage of cellars I would advise against the discharge of sewage into the north branch of Turtle creek, but I would recommend the approval of an outlet into Turtle Creek at or below its confluence with north branch; provided, that if in the future it shall be deemed advisable by the State Board of Health, provision shall be made for the purification of the sewage to the satisfaction of that Board.

Respectfully submitted,

BYRON STANTON,
Committee.

August 19, 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, September 12, 1898.

Mr. W. R. Kemper, City Engineer, Lebanon, Ohio:

DEAR SIR: The State Board of Health has considered your application for approval of a system of sewerage for the village of Lebanon. You are hereby notified that the Board has approved that part of the system which is to be laid in Mulberry street to Alley C., a distance of 1,000 feet more or less, and to be continued by a six-inch pipe to the north branch of Turtle creek, and to be used until the trunk sewer is completed; provided, however, that such sewer shall not be used for any other purpose than for the drainage of cellars.

The Board has also approved a sewerage outlet into Turtle creek at or below its confluence with the north branch, but upon the condition that, whenever it shall be deemed necessary by the State Board of Health, the sewage discharged thereby shall be purified in a manner satisfactory to said Board.

Yours truly,

(Signed) C. O. Probst,
By order of the Board. *Secretary.*

REPORT ON THE SEWERAGE OF MARION.

To the State Board of Health:

Gentlemen: The city of Marion has the separate system of sewers. The sanitary sewers are all connected to an outfall sewer which empties into the Little Scioto river. The storm water sewers have two outlets, those in the northern part of the town emptying through a six-foot trunk sewer directly into Rock Swale, which empties into the Little Scioto river just southwest of the city. The storm water from the southern part of the city is carried off by the Columbia street trunk sewer, which empties into a ditch about 200 yards west of the west corporation line; this ditch following a meandering course westward and emptying into the Rock Swale.

The sewer system has just been completed and should be in excellent condition, but through the carelessness and neglect of the city officials, the separate system has not been maintained and closet connections have been made to the storm sewers. It is admitted that they have been made to the Columbia street sewer, but it is denied that there are any house connections to the north sewer, though the conditions at its mouth seem to point to the contrary. At this point Rock Swale is a very small stream or ditch, as it has been straightened and deepened, without current enough to carry off the sediment brought down by the sewer. This fills the bed of the Swale with some two feet of foul black mud, giving off bubbles of gas continually and a pretty strong odor. The organic matter decaying in this mass is mainly due to the manure and refuse washed off the streets, but it may be supplemented by sewage from house connections, though as stated above, this is denied by the city engineer.

The number of closet connections to the southern storm sewer could not be learned, but there must be a great many. Most of these connections are made to a private sewer, two squares long, which drain several business houses and the principal hotel, then empties into the storm sewer. From the appearance of the outlet the gas plant must have connection to the storm sewer also. Just below where this storm sewer empties into the ditch, an 18-inch tile brings in all the waste and wash-water from the local brewery. The source of this sewage can easily be told from the smell of the malt.

This brewery sewer together with the storm sewer has filled the upper end of the ditch with a mass of black, foul-smelling mud a foot or more in thickness. This ditch winds around through the farm land for about a mile before it finally reaches Rock Swale. Its bed is overgrown with weeds in which are lodged the filth brought down by the high water and left to putrefy, giving off some very foul odors

The passage of this ditch near a farm house owned by the Uhler family is what caused the present complaint. The tenant on the farm had five cases of typhoid fever in his family last year and having lived there eight years before the construction of the ditch, without any sickness, claimed that the latter was the cause of the fever. The ditch passes within 200 yards of the house, and can be smelt very plainly at that distance, causing a nuisance, if not a menace to health. The family obtains their drinking water from a well. dug only 25 feet deep, and which has been in use for 60 years.

The outhouse is about 30 yards distant, and the pit when full is merely covered over and a new one dug. The typhoid cases were all among the grown members of the family, a daughter having the first case and four sons following about a week or so apart, the whole epidemic lasting eight weeks.

The sanitary sewers reach about two-thirds of the city's population, but connections are not being made very rapidly, there being only some 250 closets on them. Connections are not compulsory and the old vaults are still used. These are not water-tight and the ground must be thoroughly saturated with filth. The sanitary sewage is carried through the outfall sewer two and one-half miles southwest of the city, siphoned under Rock Swale and emptied into the Little Scioto river. A few cellar drains were learned of that were connected to the storm sewers without any traps in them. Very little information on this subject could be obtained.

Respectfully submitted,

September 10, 1898. B. H. FLYNN, C. E.

REPORT ON PROPOSED CHANGES AND ADDITIONS TO THE SEWERAGE SYSTEM OF NAPOLEON.

To the State Board of Health:

GENTLEMEN: Messrs. Riggs and Sherman, consulting engineers, have been engaged to prepare plans for improving the sewerage of Napoleon. In making an inspection of the Maumee river last July, I met Mr. Sherman in Napoleon, by appointment, and examined the present sewer outlets, the canal and river, and discussed plans for proposed changes.

Napoleon is a city with a population in 1890 of 2,764. It is about 40 miles by water from the intake of the Toledo Water Works. The Maumee river is a comparatively large stream at Napoleon, with a sluggish current, and the sewage of Napoleon is much diluted on reaching Toledo. A count of the bacteria in the river at the water works intake, made July 23, showed 270 bacteria per c. c.

The water supply of Napoleon is endangered by the outlet sewer marked " A " on the map. At the time of my visit to Napoleon I found chips from a planing mill, located *below* the mouth of the sewer, above the water works intake, where they had been carried by a gentle breeze.

The discharge of the Perry street sewer into the canal has caused a considerable nuisance.

The open trench receiving the sewage of the Scott alley sewer, is in bad condition, and adjacent property owners are threatening to sue the city for damages.

There is thus an urgent necessity for some changes to be made in the sewerage system of Napoleon.

Were it not that Toledo obtains its water supply from the Maumee river there would be no objection to Napoleon's discharging its sewage directly into the river at " D " or below.

Toledo is investigating the question of improving its water supply. A shaft nine feet square sunk on an island in the river near Toledo yielded about 4,000,000 gallons of water a day, and has been spoken of as a source of supply. But there is a doubt as to there being a sufficient quantity to meet the growing demands of the city. Aside from dangerous impurities, the Maumee river carries so much mud that the water supply of Toledo is unsatisfactory from this cause, and filtration of the river water is being considered. Filtration, or a ground water supply, would remove the objections to allowing Napoleon to sewer direct to the river.

The soil at Napoleon is unfavorable, so far as I could learn, for sewage disposal by land, being a brick clay. Artificial filter beds would probably be required.

Chemical precipitation, in my opinion, would not sufficiently remove bacteria to warrant recommending that method of sewage disposal.

In my judgment, the outlet sewer at " A," both for sewage and storm overflow, should be discontinued, as being a source of danger to the water supply of Napoleon. (Questions 1 and 2.)

The discharge of sewage at " B " has caused a nuisance, and probably would, or at least be objectionable, at " C." I can see no particular objection to allowing " B " to be used as a storm water relief outlet into the canal. (Questions 3, 4, 5 and 6.)

The Scott street alley sewer should be carried to the river if untreated sewage is to be permitted to discharge into the river. (Question 7.)

Oberhaus creek, the canal, and the Maumee river below the water works intake (and far enough below to guard against upcurrents) might, I think, be freely used for the discharge of storm water sewers. (Questions 8, 9 and 10.)

Your vote is requested upon each one of these points; and also upon the general proposition of approving of any extensions of the sewerage system of Napoleon with the discharge of untreated sewage into the river.

Very respectfully,

C. O. Probst,

Secretary.

August 18, 1898.

Toledo, Ohio, July 28, 1898.

Dr. C. O. Probst, Secretary of the State Board of Health, Columbus, Ohio:

Dear Sir: In behalf of the village of Napoleon, and in connection with the proposed sewer plans for that place, we send you under separate cover eight (8) blue print copies of the map of Napoleon, on which we have indicated points as follows, viz:

"A," being the present outlet into the Maumee river for the water works combined sewer.

"B," being the present outlet into the canal, for the Perry street combined sewer.

"C," being a point on the river bank opposite "B."

"D," being the present discharge into the river of the open trench from the outlet of the Scott street alley sewer.

"E," being the mouth of the ravine defining the eastern boundary of all that portion of Napoleon lying on the south side of the Maumee river.

That we may clearly understand the position of the State Board of Health in advance of the preparation of the plans for the complete system of sewers, we respectfully submit the following questions for their consideration, and request that we may be favored with answers at as early a date as possible, viz:

1. May we continue to discharge the water works sewer at "A," its present outlet?

2. If not, may we intercept the house sewage from the water works sewer and continue to use the outlet "A" as a storm water relief outlet?

3. May we continue to discharge Perry street sewer at "B"?

4. If not, may we continue it to the river and discharge it at "C"?

5. If not, may we intercept the house sewage from Perry street sewer and use present outlet, "B," as a storm water relief outlet?

6. If not, may we continue the Perry street sewer and establish an outlet at "C," for storm water relief?

7. May we extend the Scott street alley sewer to the Maumee river at "D," and continue to discharge at this point?

8. May we freely use Oberhaus creek for the discharge of storm water sewers only, at any convenient point or points?

9. May we freely use the canal for the discharge of storm water sewers only, at any convenient point or points?

10. May we freely use the Maumee river for the discharge of storm water sewers only, at any convenient point or points.

If, in the opinion of the Board, we have not in the above questions fully covered the problems which arise in connection with a sanitary system of sewers for Napoleon, we will gladly receive and strictly follow any additional directions which the Board may see fit to give us.

Soliciting an early consideration of the matter, we remain,

Very respectfully yours,

(Signed) RIGGS AND SHERMAN,
Civil and Consulting Engineers.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, September 19, 1898.

Messrs. Riggs and Sherman, Consulting Engineers, Toledo, Ohio:

DEAR SIRS: Your communication of July 28, 1898, in reference to plans for changes and extensions of the sewerage system of Napoleon, has been submitted to the State Board of Health. You ask:

1. May we continue to discharge the water works sewer at "A," its present outlet?

2. If not may we intercept the house sewage from the water works sewer and continue to use the outlet "A" as a storm water relief outlet?

3. May we continue to discharge Perry street sewer at "B?"

4 If not may we continue it to the river and discharge it at "C?"

5. If not may we intercept the house sewage from Perry street sewer and use present outlet "B" as a storm water relief outlet?

6. If not may we continue the Perry street sewer and establish an outlet at "C" for storm water relief?

7. May we extend the Scott street alley sewer to the Maumee river at "D," and continue to discharge at this point?

8. May we freely use Oberhaus creek for the discharge of storm water sewers only, at any convenient point or points?

9. May we freely use the canal for the discharge of storm water sewers only, at any convenient point or points?

10. May we freely use the Maumee river for the discharge of storm water sewers only, at any convenient point or points?

The Board has voted against propositions numbered 1, 2, 3, 4 and 7; it has voted in favor of propositions numbered 5, 6, 8, 9 and 10.

In voting in favor of proposition No. 10, it is with the understanding that no storm water outlet will be approved located so as to endanger the water supply of Napoleon. The Board is unanimously of the opinion that it would be unwise to sanction any further pollution by crude sewage of the Maumee river at Napoleon.

Very respectfully,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

Toledo, Ohio, September 20, 1898.

Dr. C. O. Probst, Secretary State Board of Health, Columbus, Ohio:

Dear Sir: We are in receipt of your favor of September 19, giving the rulings of the Board relative to sewer matters at Napoleon, and note the unanimity of "opinion that it would be unwise to sanction any further pollution by crude sewage of the Maumee river at Napoleon."

Such being the case, and with the object of making the strict compliance with the rulings of the Board as light a burden as possible upon the taxpayers, we respectfully request that the Board give the village three years, or until the fall of 1901, in which to comply with its rulings and complete the disposal plant, and that meanwhile sewer work may be carried on at the most urgent places and the sewage discharged into the river at the point "D," the lowest of the present outlets. This point being near a suitable location for the proposed disposal plant, and at the lower outskirts of the town.

Trusting that you can consistently comply with the above request in behalf of the taxpayers of the village of Napoleon, we remain,

Very respectfully yours,

Riggs & Sherman,
Civil and Consulting Engineers.

At a meeting of the State Board of Health, held October 12, 1898, Mr. Sherman presented completed plans for a sewerage system for Napoleon, with the request that the village be given three years' time to provide for sewage disposal.

Following is given the action taken:

Ohio State Board of Health,
Office of the Secretary,
Columbus, October 13, 1898.

Messrs. Riggs & Sherman, Consulting Engineers, Toledo, Ohio:

Dear Sirs: Your application for approval of plans for a system of sewerage for the village of Napoleon, Ohio, with outlet at point "D," as shown upon the map and plans, has been considered by the Board.

You are hereby notified that said plans and outlet have been approved, provided that the sewage shall be purified in a manner satisfactory to this Board within three years from date.

Yours truly,

(Signed) C. O. Probst,
By order of the Board. *Secretary.*

REPORT UPON A PROPOSED SEWER FOR RIPLEY.

To the State Board of Health:

Gentlemen: I have the honor to submit the following report upon the proposed sewer to be laid in Main street, Ripley, Ohio, and to discharge into the Ohio river at a point several hundred feet below the confluence of Redoak creek and the river, and nearly one mile below the water works.

Main street runs from the river to the north corporation line, at right angles with the river. It is the principal business street, but has on it some residences. It is proposed to put in a combined system of sewers for a distance of 2,406 feet from the river. It will be made of vitrified sewer pipe, except the terminal portion of 348 feet, from the end of Main street to a point in the river below low water mark, where on account of the steep grade, the sewer will be of 24-inch iron pipe. From the point of beginning the sewer will be 12 inches for a distance of 631 feet and have a fall of 4 feet 6 inches in 100 feet, then 18 inches for 176 feet, with a fall of 2.83 inches in 100 feet, then 21 inches for a distance of 420 feet, with a fall of 6 inches in a 100 feet, then 24 inches for 833 feet, with the same fall, thence down the river bank at a grade of 16 feet in 100 feet, this terminal portion of iron being secured in position by two retaining piers in the bank and one at the outlet.

The sewer is planned with reference to the extension of the system to other streets to the west, though it is now proposed to build the Main street sewer only. With the steep grade I regard the size of the sewer as sufficiently large for any possible extensions for both house sewage and storm water, the close proximity of Redoak creek, which very nearly parallels Main street but a short distance to the east, reducing the area from which the storm water must be carried.

No catch basins will be put in, but there will be a number of inlets. It is thought that the steep grade will prevent any clogging of the sewer. A Rhodes-Williams siphon flush tank with a capacity of 960 gallons will be put in at the head of the sewer. This will discharge at least three times a day, and can be arranged to discharge oftener if necessary. Y branches will be put in every 25 feet for house connections.

In my opinion this is a step in the right direction for improving the sanitary condition of Ripley, and I would recommend the approval of the proposed plans.

Respectfully submitted.

BYRON STANTON,
Committee.

August 18, 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, September 8, 1898.

Mr. E. F. Layman, Civil Engineer, Cincinnati, Ohio:

DEAR SIR: The State Board of Health has considered your application for the approval of a sewer to be built in the main street of Ripley, Ohio, and to discharge into the Ohio river at a point several hundred feet below the confluence of Redoak creek and the river, and you are hereby notified that the outlet of said sewer has been approved.

Yours truly,

(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

REPORT ON ADDITIONAL SEWERAGE FOR TOLEDO.

To the State Board of Health:

GENTLEMEN: You will remember that a committee from Toledo appeared before our Board at its last meeting and requested approval of certain plans for sewerage. They were requested to furnish the Board with a map showing both the proposed and constructed sewers of Toledo. The engineer has filed such a map, and has also provided profile maps of sewer No. 676 which is to be constructed in District No. 30, and sewer No. 680 which is to be constructed in District No. 29.

He requests that the earliest possible action be taken upon these plans as bids have been received for construction of the sewers and they wish to commence work at the earliest possible time. The outlets of these two sewers are not far from the mouth of the Maumee river and several miles below the outlet of the sewer approved by the Board a year ago. As the river is constantly a large stream at Toledo, and discharges into the lake a short distance from where these sewers empty into it, and as there are no water supplies to be polluted by the sewage, there would seem to be no objection to approval of the plans.

I enclose the profile maps of the sewers under consideration and a copy of the specifications under which all sewers in Toledo are constructed. Please mail your vote as soon as convenient.

Yours truly,
C. O. PROBST, ,
Secretary.

February 11, 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, February 28, 1898.

Mr. W. F. Brown, City Civil Engineer, Toledo, Ohio:

DEAR SIR: The State Board of Health has considered plans filed by you for sewering Districts No. 29 and 30, in the city of Toledo, with outlet sewers discharging into the Maumee river, and you are hereby notified that said plans have been approved.

Yours truly,
(Signed) C. O. PROBST,
By order of the Board. *Secretary.*

TOLEDO, OHIO, April 15, 1899.

To the State Board of Health, Columbus, Ohio:

GENTLEMEN: Maps and plans of Sewer District No. 28, are herewith submitted for your approval. There is little to be said in explanation of the plans for this District, outside of the facts which the plans themselves disclose. The main sewer is to be located in Dearborn avenue, formerly Port Clinton turnpike. The outlet is 90 inches in diameter, and discharges into the Maumee river. The plans for this district are designed for combination sewers, with some few exceptions where the storm water is otherwise provided for.

Very truly yours,
(Signed) W. F. BROWN,
City Civil Engineer.

TOLEDO, OHIO, April 12, 1898.

To the State Board of Health, Columbus, Ohio :

GENTLEMEN : I submit herewith plan and map of sewer District No. 33, and beg your Board's approval of the plan which has been outlined for the relief of the District mentioned. The section noted on the map is right in the business portion of the city, and includes portions of several sewer districts. The great increase in storm water and private connections has burdened the main sewer in Jackson street far beyond its capacity, and after a most careful investigation of the whole matter I find that the only feasible plan is to construct an auxiliary sewer in Adams street from the Maumee river to Sixteenth street. The plans, as we have outlined them, call for a sewer 72 inches inside diameter from Water street to Michigan street, and 54 inches inside diameter from Michigan street to Sixteenth street. The sewer will have a trap at the river, and a special section to pass under Water street, which lies quite low. At Michigan street there will be an overflow connection with the sewer in Jackson street, either by a gate in the present sewer in Michigan street, or a new sewer through Michigan street at such an elevation that no necessity will exist for a gate. The necessity for this sewer has become very pressing of late, and the plan proposed offers full relief from the present difficulties and meets the approval of the property owners affected.

Very truly yours,

(Signed) W. F. BROWN,

City Civil Engineer.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, May 4, 1898.

Mr. W. F. Brown, City Civil Engineer, Toledo, Ohio.

DEAR SIR: The State Board of Health has considered your application for approval of plans for Sewer Districts No. 28 and No. 33 for the city of Toledo, and you are hereby notified that said plans have been approved.

Yours truly,

(Signed) C. O. PROBST,

Secretary.

By order of the Board.

REPORT ON PROPOSED SEWERAGE FOR WINTON PLACE.

To the State Board of Health:

GENTLEMEN: The village of Winton Place, near Cincinnati, having made application for approval of the outlet of a sewerage system which it is proposing to construct, the undersigned committee visited that place on June 27, and begs leave to report as follows:

Winton Place is a village of about 1,200 inhabitants, located east of Spring Grove Cemetery, and lies contiguous to the city of Cincinnati. There are 193 houses in the village, with 20 streets having a total length of six miles. It is proposed to construct a sewerage system embracing all of the village, which is to be a combined system; only such storm water, however, will be taken into the sewers as cannot be drained from the surface, and it is proposed to have a main outlet sewer 30 inches in diameter.

Detailed plans of the sewerage system have not yet been made, as the village wishes, in the first place, to know whether the proposed outlet will be approved by this Board. The outlet is to be into Mill creek, and it is proposed to construct two outlets, one into Mill creek at Station avenue, and the other into Mill creek in the eastern part of the village near the C., H. and D. railroad.

Mill creek is a small stream having a water-shed area of 219 square miles, and an urban population upon it, in 1890, of 304 510. The city of Cincinnati is discharging considerable sewage into Mill creek near where the village of Winton Place is proposing to discharge its sewage. Your committee is of the opinion that the proposal to establish two outlets should not be approved, for the reason that if sewage purification works should be demanded in the future, it would be better to provide now for but one outlet. It appears possible to carry all the sewage to the creek by one main sewer. At one of the proposed outlets it would be possible to construct a plant for disposal of the sewage by chemical precipitation. There is not sufficient suitable land at this place for disposing of the sewage by land treatment.

Your committee therefore begs leave to recommend that the proposal of Winton Place to establish a sewerage system and discharge sewage into Mill creek be approved, subject to the provision that the village shall be required to purify its sewage in a satisfactory manner whenever deemed necessary by the State Board of Health.

Respectfully submitted,

Byron Stanton,
C. O. Probst,
Committee.

Ohio State Board of Health,
Office of the Secretary,
Columbus, July 14, 1898.

Mr. Frank F. Dinsmore, Attorney-at-Law, Cincinnati, Ohio:

Dear Sir: The State Board of Health has considered your application for approval of plans for a sewerage system for the village of Winton Place. The Board does not approve of providing two outlets for sewage, believing that some form of sewage purification will probably be necessary for Winton Place in the near future, and that it would be better, if possible, to provide but one outlet for the proposed system. The Board also imposes a condition for approval: Namely, that the sewage of Winton Place shall be purified in a satisfactory manner whenever it shall be deemed necessary by the State Board of Health.

You are hereby notified that, subject to these conditions, your plans have been approved.

Yours truly,

(Signed) C. O. Probst,
By order of the Board. *Secretary.*

MISCELLANEOUS.

REPORT OF AN INVESTIGATION OF A SCHOOL BUILDING AT FOSTORIA.

To the State Board of Health:

SIRS: At the request of the board of health of Fostoria I visited that city March 25, 1898. I was informed that the board of health had condemned certain school rooms and recommended that their use be discontinued, and that the board of education had manifested its intention of not complying with this recommendation. The board of health wished to have the advice of the State Board of Health as to the fitness of these rooms for school purposes, and as to their warrant for ordering them closed.

The rooms in question are two of the basement rooms of the Central School building. This is a large three-story brick building with a basement, in which classes of many grades are taught, including the high school classes. The basement room at the southeast corner of the building is used for scholars of the Sixth grade, aged, probably, 9 to 11 years. The room is 26 by 26 feet and 8½ feet high. Almost 2½ feet are below the surrounding ground. It was stated that there are double floors, but there was no way of verifying this. The room is lighted by two windows at the left and three windows at the back of the pupils. These windows are each 30 by 56 inches, counting glass only. As many as 45 pupils at times occupy the room, which gives a lighting surface for each pupil of not quite 186 square inches. Authorities in school hygiene state that pupils should have from 300 to 350 square inches. Cohn, a German authority, says the lighting space should be one-fifth of the floor space, or 30 inches to the foot. This room has only 12.6 inches per square foot of floor space. This room was examined on a very bright day, and work on the blackboards, of which there were three—to the front, left and right of the room—could easily be read from any part of the room. The teacher stated that on cloudy days the blackboards could not well be used. Heating is by steam-pipes running along the walls of three sides of the rooms. There has been no difficulty in keeping them warm. The teacher stated that the room was not damp, and there was no evidence of dampness, although the visit was made after several days of very wet weather There is no means for ventilation except by open windows. All of these were partly open when the room was examined, and there was no bad odors noticeable. Pupils completing the ordinary course of instruction would occupy this room one school term. Under present provisions they would go next to the other basement room, the Seventh grade. There is a maximum of 44 pupils attending this room, a year or two older than the pupils in the Sixth grade. The conditions here are much the same as those already given for the other room. There are six windows, three back and three to the right of the pupils. Their size, counting only lighting area, is 28 by 56 inches, which gives 213 square inches of glass for each pupil, and is equal to 14 inches for each square foot of floor space. While this room receives more light than the other, it is much worse lighted owing to the position of the windows. From the back of the room writing in large hand on the board at the front of the room could be read only with difficulty. In certain parts of the room work on portions of the blackboard could not be read at all, owing to a glare of light. The lighting of both of these rooms is bad, and conditions very favorable for the production of eye troubles among their occupants. The room with six windows could be considerably improved, in respect to light, by changing the direction of the seats. Except in weather permitting windows to be opened (and pupils must set close to windows) the ventilation in both must be very defective. There are two class rooms in the upper story of the building, and a large hall, occasionally used for an assembly room. Sixty-four steps are required in mounting to this floor. School rooms could be made there, temporarily, and it would, in my opinion, be much less injurious for pupils to mount to the top floor than to occupy the basement rooms, especially if pupils not indergoing the changes incidental to puberty were not required to use the upper rooms.

On the second floor a room is used for a laboratory, having classes of eight to 10 for one or two hours a day. The basement could much better be used for a laboratory than for a school room, and this transfer might be made.

I would therefore respectfully recommend that the board of health of Fostoria be sustained in condemning the two basement rooms in the Central School building for ordinary class rooms.

Respectfully submitted,

C. O. Probst,

Secretary.

REPORT ON THE SANITARY CONDITION OF LAKESIDE.

To the State Board of Health:

Gentlemen: At your request the undersigned committee visited the Lakeside grounds on Wednesday, May 4, for the purpose of investigating the sanitary condition of said resort, and respectfully submit the following report for your consideration :

The sewers are in a bad condition, as they are defective in drainage and also leak near some of the favorite wells. However, in compliance with the demands of this Board some months ago, all the wells on the grounds have been closed except two, known as the Bradley Temple well and the McKenzie well. This last named well is located in a sort of a basin near the head of the sewer system, and there are perhaps 50 privies within 200 yards of this well which have no vaults or receptacle for the offal, which is simply left on top of the ground. The character of the soil (which is not more than five or six inches deep) and of the rock (which is limestone, full of crevices and fissures) makes contamination of the well water unavoidable. Hence, our instructions to the managers of the grounds were to close these wells in accordance with the orders of this Board sometime ago which allowed them to be used until May, 1, 1898.

We next considered the water supply from the lake. We found this in all respects the same as reported by Drs. Wise and Probst in 1896. The fact that the managers of this resort acknowledged that they had received numerous protests from the public, who patronize the place, regarding the water supply, makes it all the more urgent that this Board should take prompt action for remedying the present state of affairs. We take the following from the report of Drs. Wise and Probst referred to: "All of the cottages, of which there a large number, the hotel and the public drinking fountain, which is the usual supply for transient visitors, obtain water from the lake. The intake pipe is about 100 feet from the shore and where there is a usual depth of water of seven or eight feet. The ordinary current of Lake Erie is from west to east, though very inconstant, but even this slight protection was neglected at Lakeside, as the water is taken east of the village. * * * * About 500 or 600 feet west of the pier the outlet sewer discharges into the lake near the shore. This carries practically all of the sewage, which amounts to considerable. * * * * * The sewer and water intake are about one-fourth of a mile apart. The water at the sewer's mouth was very foul."

Practically the same conditions exist at present as when that report was made to this Board two years ago.

As to the disposition of the garbage on the grounds the secretary of the Lakeside company informed your committee that the cottagers and residents are expected to deposit their garbage in barrels and these are to be carted away from the grounds at stated times. Our investigation convinced us that this system is practically a "dead letter," and enough garbage is thrown out on the ground, and allowed to remain there to be absorbed by the soil, to cause sickness and all the usual results that follow such unsanitary conditions.

We respectfully present the following recommendations:

1. That all wells upon the Lakeside grounds be closed and filled, and the further use of well water be prohibited.

2. That the use of the present water supply from Lake Erie be condemned, and the Lakeside company be required to provide for the purification of said supply in a manner satisfactory to the State Board of Health before opening their grounds to the public.

3. That where water closets are connected with the sewers they shall be properly trapped, and shall be provided with flush tanks to do away with the present objectionable method of flushing them by hand.

4. That the two public water closets, now in a very bad condition, be overhauled and reconstructed in accordance with the best sanitary methods.

5. That the use of privy *vaults* be prohibited: and where connections with a sewer are not made, that a tight box or receptacle above ground, with a plentiful supply of dry earth or other absorbent material, be required for each privy.

6. That during the Assembly season a sanitary policeman, appointed by the local board of health, approved by the State Board of Health and paid by the Lakeside company, shall be required to make a daily inspection of the grounds and buildings and report promptly to the Lakeside company and to the local board of health, all unsanitary conditions.

7. That the Lakeside company be required to carry out these provisions before the grounds are permitted to be opened to the public.

Respectfully submitted,

W. T. GEMMILL,
R. D. KAHLE,
Committee.

REPORT ON THE POLLUTION OF A DITCH AT LEIPSIC.

To the State Board of Health:

GENTLEMEN: I have the honor to submit the following report in regard to the Hickey or Williams ditch of Leipsic. In response to the following petition I visited Leipsic on August 15, and with the local board of health examined the ditch in regard to its alleged unsanitary condition:

LEIPSIC, OHIO, August 6, 1898.

Dr. C. O. Probst, Secretary State Board of Health, Columbus, Ohio:

DEAR SIR: We, the undersigned, residents of Leipsic and members of the board of health, do hereby represent—

1. That the Hickey or Williams ditch runs through Leipsic, near the center from south to the north.

2. That the board of health has declared said ditch to be in an unsanitary condition, and has ordered the council to take steps to have said ditch sewered.

3. That the council has refused to act in accordance with the orders of the board of health.

4. That the sewers of Main and other streets empty directly into this ditch, and there has been much typhoid fever and other fevers along and near said ditch. It has not been cleaned for years.

Now we pray for immediate help and instructions from the State Board of Health.

Respectfully yours,

H. C. Ruhl, M. D., *Mayor.*
George F. Kuntz, *Member Board of Health.*
J. S. Emery, " " "
G. L. Clark, " " "
J. F. Leffler, " " "
W. W. Smith, " " "
L. S. Lafferty, *Teacher.*
F. W. Underhill, *J. P.*
J. S. Esely, *Jeweler.*
C. C. Switzer, *Teacher.*
Sol Young.
Dr. Louisa M. Emery.
W. A. White, *M. D.*
G. C. Foltz, *Sanitary Police.*
A. J. Conrad.
L. W. Kuntz, *Grocer.*
John Ginther,
Chas. J. Kuntz, *Grocer.*
S. A. Dudley, *Contractor.*
J. W. Phister.
T. F. Hummuon, *Merchant.*
B. W. Ginther.
L. B. Alford, *Implements.*
S. Askam.
Julia A. Fulk.
Mrs. E. J. Stewart.
Charles Huber.
F. S. Leffler, *Contractor.*
M. Galloghy.
J. D. Ginther.
N. N. Kunkle.
C. S. Buckley, *Druggist.*

Leipsic, Ohio, August 8, 1898.

I hereby certify that the facts and statements set forth in the hereto attached statement are correct.

(Signed) A. A. Kober,
Clerk of Corporation and Clerk of the Board of Health

The ditch as stated in the petition runs from south to the north through the village. It is a county ditch and has been in use for a great many years. Quite a number of residences are located along the banks of this ditch, and I was told by some of the residents that the stench arising at times is almost unendurable. Besides the stench which is given off from this ditch, not the least objectionable feature is the pollution of the wells along its course. The wells, I was informed, along this ditch are about 14 feet deep; that is, the shallow wells, of which it will be seen, by the enclosed letter from Mayor Ruhl, that there are fifteen of them within 100 feet of the ditch, and three more are within 200 feet. Leipsic has been suffering from typhoid fever for several years. At my request Dr. H. C. Ruhl procured for me a list of the wells that are near the ditch, also a list of the typhoid fever cases. I append this letter as part of my report, and also a letter from Mr. L. S. Lafferty, President of Leipsic College.

LEIPSIC, OHIO, August 16, 1898.

Dr. R. D. Kahle, Vice President State Board of Health, Lima, Ohio:

SIR: Below I send you a list of wells situated along the course or close to Hickey ditch. First will be a list of wells within 100 feet of the ditch, and will designate shallow or deep by letters S. and D.: George Askam, S.; Dr. Emery, S.; Dr. Hickey D.; Mrs. Steward, D.; Mrs. Irwin, S.; Henry Kegger, S.; Samuel Waters, S.; Chas Huber, S.; O. N. Agner, S.; Samuel Dudley, S.; Andrew Kober, S.; Jacob L. Lefiler, S.: Mrs. Dildine, S.; Dr. Newman, S.; Henry Leiter, S.; 200 feet from ditch, Court Clark, S.; J. K. Baughman, S.; Jonas Lenhart, S.; Galloghy, D.; Lafferty, D.; Martin Blodget, D.

Below is a list of typhoid fever cases that have taken place last year and year before last, so far as I am able to ascertain: Martin Blodget family (1896), three sick, two deaths; George Butler (1896), four sick, one death; David Ginther (1896–97), family have been poorly for the last three summers, but not typhoid; Dr. Starr (1896), two sick, no deaths; Louis Lafferty (1896), one sick, no deaths; Louis Lafferty (1897), one sick, one death; Pearl Galloghy (1897), no deaths; Charles and Lolo Schweitzer (1897), no death; Frank Winkler (1896), no death; Mrs. Trott, one boarder (1896), no death; Dr. Emery's (1896), one sick, one death. These cases all took place immediately along the course of the ditch in the years mentioned following the name, and I think were all typhoid. Other cases in various parts of the village in the past two years are Rev. Ernsberger (1897), two sick, no deaths; John Clinefelter (1897), one sick, no deaths; John Therwechter (1897), one sick, no deaths; Frank Egbert (1896), one sick, one death; Harrison Johns (1896), two sick, one death; Charles Kek (1896), one sick, no death; Leonard Butler (1896), three sick, one death.

In 1895, there were only two deaths here from typhoid. I have endeavored to give you a record of all cases so far as I am able to find out, and I believe they were all typhoid fever. Awaiting your reply,

Yours truly,

(Signed) DR. RUHL.

LEIPSIC, OHIO, August 23, 1898.

Dr. R. D. Kahle, Lima, Ohio:

DEAR SIR: When will we hear from the State Board? Our council still refuses to act. There are five or six new cases of typhoid along and near Hickey ditch. One young man, Albert George, died last night of typhoid. We have had nearly 40 cases in the last two years near this ditch.

1. Twenty or more privy vaults are connected with it.
2. The town has its dumping ground southwest of the town, within one-half mile of corporation. The Hickey ditch runs through this ground and drains it all through the town. All the garbage and cleanings from privy vaults is put on this dumping ground and only partly covered.
3. The Buckeye Stave Company drain their steam boxes into the Sugar street sewer that runs into this ditch. Two deaths from typhoid have occurred in the last few days along this Sugar street sewer. The decomposing vegetation from the Buckeye works makes this Sugar street sewer very unhealthy.

There have been two damage suits filed against the corporation for several thousand dollars.

It seems to me that our health officers and council have gone to sleep or become deaf, and it will take more than an ordinary cyclone to arouse them.

It would be with great satisfaction of at least partial relief that we hope to hear from you soon.

Very truly yours,

(Signed) L. S. LAFFERTY,
President Leipsic College.

The village has no public water supply, but is partly sewered. Two public and several private sewers empty into this ditch. While an effort has been made to prevent water closets from being connected with the sewers, for they are intended for storm water only, yet I am told that quite a number of connections have been made. That this ditch is a menace to the health of the citizens of Leipsic and vicinity, I think will admit of no doubt. That typhoid fever is communicated by polluted water is well known.

I would recommend that the local board of health close all the shallow wells in the village; that the Hickey ditch be condemned as a menace to health, and that it be sewered through the village (it is sewered for about 150 feet); that water closets shall not be connected with any sewer that empties into this ditch.

R. D. KAHLE,
Committee.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, September 8, 1898.

To the Board of Health, Leipsic, Ohio :

GENTLEMEN : I enclose herewith a copy of a report on the pollution of a ditch at Leipsic, made by Dr. Kahle, a member of the State Board of Health, and which has been submitted to and received the approval of the Board.

Your board of health should now take some action in carrying out the recommendations of this report. The shallow wells spoken of should be closed. If an examination of the water of these wells is necessary to determine whether they are polluted, this will be undertaken by the State Board of Health free of charge. Your board should also adopt a resolution prohibiting any water closets or sewers being emptied into Hickey ditch. A reasonable time should be granted to those now having sewer connections with this ditch to make other arrangements for disposing of the sewage. If council is unwilling to take any action in regard to sewering the ditch, as recommended, your board should adopt a resolution declaring it to be a nuisance and should serve notice upon the council to abate the nuisance. If this is not done within a reasonable time, your board should bring action against the members of council for disobeying the orders of the board of health. In regard to nuisances, corporations may be prosecuted the same as individuals.

Trusting that prompt action will be taken for the abatement of this nuisance, I am,

Yours truly,

(Signed) C. O. PROBST,
Secretary.

By order of the Board.

REPORT ON THE SANITARY CONDITION OF RIPLEY.

To the State Board of Health :

GENTLEMEN : For the third time in the last five years I am called upon to report upon the sanitary condition of Ripley. My last inspection was made June 30, 1898, and I must say that without a single exception Ripley is the filthiest town I have ever seen, although I was told that I was seeing the place under comparatively favorable circumstances, the copious rains of five days before having flushed the gutters and washed much of the filth from the streets. Not only was there a lack of cleanliness in the streets and alleys, but many of the private yards and grounds were filthy beyond description. There was everywhere manifested an utter disregard for health, comfort or decency. The atmosphere of the place was reeking with ammonical odors from the urine of horses and cows and the noisome effluvia of hog pens and the washing of the contents of the privy vaults into the alleys, down spouts from the buildings being turned into shallow vaults to keep them flushed—a method of disposal of night-soil, upon which there is no patent, and to which the attention of the sanitary organizations of the country has not yet, I think, been called.

From the assessors returns for this year I learn that there are about 150 hogs kept in the town. From the odors, I doubt the correctness of the returns. Many cows are stabled at least at night, in the town, the urine finding its way into the alleys, and the droppings being heaped up with the horse manure in the alleys for months at a time.

The streets and alleys are never cleaned by the town authorities. Here and there a more enterprising citizen may essay the work of purification for his own surroundings, but these efforts are so few and far between that but little impression is made. Many of the gutters are obstructed with weeds. In other places the grades are such that slops and the washings of livery stables and alleys stand in pools in the streets until removed by evaporation. Houses with water closets have sewers extending but a short distance below high water mark, so that for much of the year the sewage is exposed to sun and air on the river bank within the village limits. One at least discharges sewage into Redoak creek, a small stream flowing through the place, which for weeks in the summer time would be dry but for the sewage. A public dump is on one of the main residence streets, at the end of the bridge over Redoak creek. The town lockup, which was the subject of comment in my report of May, 1896, is in *statu quo*, though a considerate acting mayor no longer sentences convicts to its walls.

Ripley at one time had a board of health, and that board elected an efficient health officer, Dr. G. P. Tyler, who has ever manifested an earnest desire to improve the sanitary condition of the place, and who has sought to enforce all of the laws and regulations relating to sanitary matters and vital statistics, but being only the executive of the board of health he cannot bring any action except by order of the board, and the board being defunct, his hands are tied. The last meeting of the board was held on the occasion of Dr. Probst's visit to Ripley in 1895, when a case of smallpox occurred there. The council has not elected a member of the board of health for over two years, and the three last elected never presented themselves to be sworn in, and the terms of service of the others have expired by limitation of law. So adverse to sanitary supervision are the majority of the people that it seems almost impossible to get any one to serve on the board of health. The health officer has not the coöperation of the town officials nor the moral support of the citizens. It is impossible for him to collect the vital statistics of the town. Marriages, births and deaths go unreported, interments are made without permits from the health officer, diseases dangerous to the public health are not reported by the physicians, hence placarding cannot be done by the health officer. Children with contagious diseases come and go at their own will.

Ripley is abundantly supplied with a water of superior quality and to this may be attributed in a great measure the freedom from the more pestilential diseases. The natural conditions for surface drainage are good and the town is favorably situated for a system of sewers at small cost. The grades of the streets and proximity to the river would make it an easy and not very expensive matter to so sewer the place as to remove many of the sources of discomfort and danger and greatly assist in the accomplishment of that most difficult of disinfections—the removal of the odor of a dead board of health.

I would recommend that the State Board of Health shall make one more effort to have the council of Ripley elect a board of health that will not be afraid to compel the observance by the preachers, doctors undertakers, and, indeed, by all of the citizens of the laws, rules and regulations relating to sanitary matters and vital statistics.

Respectfully submitted,

BYRON STANTON,
Committee.

Cincinnati, July 6, 1898.

OHIO STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
COLUMBUS, July 14, 1898.

To the Village Council, Ripley, Ohio:

DEAR SIRS: I enclose herewith a copy of a report by Dr. Stanton upon the sanitary condition of Ripley. This report has been submitted to and received the approval of the State Board of Health. It is to be sincerely hoped that the condition of affairs as set forth in this report will receive your prompt attention and steps be taken to better the sanitary condition of your village.

Yours truly,

(Signed) C. O. PROBST,
Secretary.

By order of the Board.

REPORT UPON A PROPOSED APPOINTMENT OF A COMMISSION TO STUDY THE CAUSE OF YELLOW FEVER.

The undersigned attended the meeting of the American Public Health Association, held at Philadelphia, October 26–29, 1897, as a delegate from the Ohio State Board of Health. At that meeting I was appointed a member of a committee having as its purpose to bring to the attention of the President of the United States the need of some action for the prevention of yellow fever.

The commission so appointed met at Washington, D. C., November 15, and, by appointment, had a conference with the President who was deeply interested and favorably impressed with the presentation of the subject made by the committee. The President requested that the objects aimed at, also the draft of a law of Congress for carrying the same into effect, be submitted to him in writing. In compliance the following papers were prepared and submitted:

American Public Health Association,
Washington, D. C., November 15, 1897.

To the President:

Sir: At a meeting of the American Public Health Association held in Philadelphia, October 26-29, 1897, the following resolution was adopted:

Resolved: That a committee of seven be appointed, to wait upon the President of the United States of America, and lay before him the urgent necessity, as viewed by the American Public Health Association, for the appointment by Congress of a commission of expert bacteriologists to be sent to Havana, for the purpose of making a thorough study of the cause and prevention of yellow fever.

The following committee was appointed in accordance with the above resolution:

Dr. H. B. Horlbeck, Health Officer, Charleston, S. C.
Dr. S. H. Durgin, President Board of Health, Boston, Mass.
Dr. A. H. Doty, Health Officer, New York, N. Y.
Gen. G. M. Sternberg, Surgeon-General U. S. Army.
Mr. Josiah Hartzell, Member State Board of Health, Ohio.
Dr. S. R. Olliphant, President State Board of Health, Louisiana.
Dr. R. M. Swearingen, State Health Officer, Texas.

It is hardly necessary to call your attention to the serious results of the epidemic of yellow fever in the States of Louisiana, Mississippi and Alabama, but we may be permitted to mention the fact that the great epidemic of 1878 resulted in the loss of nearly 16,000 lives and that it has been estimated that the total loss to the country resulting from this epidemic was not less than $100,000,000.

If the disease had been introduced six weeks earlier the epidemic of the present year might easily have reached proportions equal to that of 1878, or of the wide spread and disastrous epidemic of previous years —1853, 1867, 1873. The American Public Health Association has a membership of nearly 1,000, including the leading sanitary authorities and health officials of the United States, of Canada, and of Mexico. Since its organization in 1872, it has always taken a prominent part in encouraging scientific investigations to serve as a foundation for practical sanitation, in disseminating a knowledge of the conditions which favor the extension of epidemic diseases and of the means of prevention, and in securing necessary sanitary legislation.

In our opinion the matter which we now ask you to consider is of great importance, and we respectfully request that you will bring it to the attention of the Congress of the United States at an early date in such manner as may seem to you to be best. We transmit herewith a draft of a bill, the enactment of which would in our opinion accomplish the object in view.

Very respectfully yours,

H. B. HORLBECK,
SAMUEL H. DURGIN,
GEO. M. STERNBERG,
JOSIAH HARTZELL,
S. R. OLLIPHANT,
A. H. DOTY.

Dr. R. M. Swearingen, State Health Officer of Texas, was not able to meet with the committee.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

Section 1. A commission of experts shall be appointed by the President for the purpose of making investigations relating to the cause and prevention of yellow fever.

Section 2. This commission shall consist of four expert bacteriologists, one to be detailed from among the medical officers of the army, one from among the medical officers of the navy, one from among the medical officers of the marine hospital service, and one to be appointed from civil life.

Section 3. The President shall name one of the members of the commission as chairman, who shall direct the work of the commission and report to him from time to time the results attained. The headquarters of the commission shall be in Washington, D. C., and one or more of the members shall be detailed to conduct investigations in the city of Havana, Cuba, or in some other locality where yellow fever prevails.

Section 4. The medical officers of the army, the navy and the marine hospital service, detailed as members of this commission shall receive no compensation beyond their salaries. But during the time they are necessarily absent from their proper stations in the performance of the duties imposed upon them by this act, their necessary living and traveling expenses shall be paid from the appropriation made in this act. The civilian member of the commission shall receive in addition to his necessary living and traveling expenses, $6 per day during the time he is actually employed in prosecuting the investigation contemplated by this act.

Section 5. The sum of $20,000 is hereby appropriated out of any money in the treasury of the United States not otherwise appropriated, for carrying out the provisions of this act and for the purchase of necessary instruments and material, for rent of a laboratory in Havana, Cuba, or elsewhere, and for other incidental expenses.

Having completed the work for which it was appointed the committee adjourned November 16.

JOSIAH HARTZELL.

LIST OF

CITIES AND VILLAGES

HAVING

BOARDS OF HEALTH,

WITH NAME OF

HEALTH OFFICER.

JUNE 1, 1890.

HEALTH OFFICERS.

CITIES.

Akron	Dr. E. S. Underwood
Alliance	Dr. P. W. Welker
Bellaire	Dr. D. W. Boone
Bucyrus	Dr. W. A. Daugherty
Canton	Dr. J. F. Marchand
Chillicothe	Dr. J. M. Hanley
Cincinnati	Dr. W. A. R. Tenney
Circleville	Mr. John L. Cummins
Cleveland	Dr. G. F. Leick
Columbus	Dr. W. D. Deuschle
Dayton	Dr. C. W. King
Defiance	Dr. E. E. K. Chapman
Delaware	Dr. D. E. Hughs
East Liverpool	Dr. C. B. Ogden
Fremont	Dr. O. C. Vermilya
Findlay	Mr. Amos Beardsley
Fostoria	Mr. W. N. Caldwell
Galion	Mr. C. F. Eise
Gallipolis	Dr. James Johnson
Greenville	Dr. John D. Kerlin
Hamilton	Mr. Peter A. Clair
Ironton	Dr. E. E. Wells
Kenton	Mr. F. H. Fall
Lancaster	Dr. F. P. Stukey
Lima	Dr. L. F. Laudick
Mansfield	Dr. J. Harvey Craig
Marietta	Dr. B. F. Hart
Massillon	Dr. T. Clarke Miller
Martin's Ferry	Dr. J. W. Darrah
Marion	Mr. G. W. Blain
Middletown	Dr. George D. Lummis
Mt. Vernon	Dr. H. W. Blair
Newark	Dr. D. M. Smith
Norwalk	Dr. Edgar Martin
Piqua	Dr. F. E. Kitzmiller
Pomeroy	Dr. R. E. Stobart
Portsmouth	Dr. Joseph Swander
Salem	Dr. F. T. Miles
Sandusky	Dr. C. Eugene Stroud
Steubenville	Mr. John Welch
Springfield	Dr. Henry H. Seys
Tiffin	Dr. A. C. Schwartz
Toledo	Dr. J. T. Woods

Troy	Dr. T. M. Wright
Urbana	Dr. H. M. Pearce
Warren	Dr. D. E. Hoover
Washington C. H	Mr. J. M. Edwards
Wellston	Mr. Thomas Wilson
Wellsville	Mr. Joseph T. Warren.
Wooster	Dr. Joseph E. Barrett
Xenia	Dr. A. D. DeHaven
Youngstown	Dr. H. E. Welch
Zanesville	Dr. H. T. Sutton

VILLAGES.

Aberdeen	Dr. T. Heaton
Ada	Mr. W. H. Morrow
Adamsville	Mr. S. J. Lane
Adelphi	Mr. W. W. Rouse
Addyston	Mr. Hugh Kennedy
Albany	Dr. A. F. Holmes
Alger	Dr. R. F. Coppers
Alvordton	Dr. T. E. Schrider
Amelia	Dr. W. B. Doan
Andover	Mr. L. W. Houghton
Anna	Dr. C. W. B. Harbour
Ansonia	Dr. H. A. Snorf
Antwerp	Mr. Charles Roberts
Arcadia	Mr. Adison Huffman
Arcanum	Mr. E. B. Hawley
Archbold	Mr. August Ruihley
Arlington	Mr. W. D. Sebastian
Ashland	Dr. D. L. Sampsel
Ashtabula	Dr. A. W. Hopkins
Ashley	Dr. H. N. Coomer
Ashville	Mr. J. W. Johnson
Athens	Dr. J. L. Henry
Attica	Dr. C. A. Force
Avon	Dr. T. B. Dailey
Bainbridge	Dr. R. H. McKee
Bakersville	Dr. C. R. Kitsmiller
Baltimore	Dr. C. M. Alt
Barberton	Dr. C. H. Whipple
Barnhill	Mr. John Stevenson
Barnesville	Mr. W. A. Talbot
Batavia	Mr. Joseph Bicking
Batesville	Mr. W. K. Cooper
Beach City	Mr. E. W. Spidell
Beallsville	Mr. John W. Reed
Beaver Dam	Dr. J. W. Wiseley

Bedford	Mr. Lewis C. Whitaker
Bellbrook	Mr. Rolla Davis
Belle Center	Mr. J. F. Ewing
Bellefontaine	Dr. R. W. Chalfant
Belleville	Dr. N. R. Eastman
Bellevue	Mr. John Battie
Belmore	Dr. G. B. Adrian
Belmont	Mr. David S. Pierce
Benton Ridge	Dr. R. D. Whisler
Berea	Dr. E. O. Hess, Clerk
Berne	Dr. G. G. Mallett
Bethel	Dr. Julius D. Abbott
Bettsville	Mr. R. R. Ridley, Clerk
Beverly	Mr. F. A. Pomeroy
Blake Mills	Mr. Edward Steinbaugh
Blanchester	Dr. N. W. Van Winkle
Bloomingburg	Mr. L. Dellinger
Bloom Center	Dr. O. C. Wilson
Bloomdale	Mr. E. Wineland
Bloomingdale	Mr. E. R. Blackburn, Clerk
Bloomville	Dr. T. C. Loose
Bluffton	Dr. J. F. Rudy
Bond Hill	Mr. D. Edw. Murphy
Botkins	Mr. Allen Wical
Bourneville	Dr. D. S. Smith
Bowerston	Dr. C. E. Siegrist
Bowersville	Mr. C. E. Miars
Bowling Green	Mr. A. Ordway
Bradford	Mr. John Tinkler
Bradner	Mr. F. Kirk
Bridgeport	Dr. J. Andrew Heinlein
Brilliant	Dr. F. L. Dugall
Brooklyn	Mr. R. E. Stickney
Brookfield	Mr. W. A. McIntosh
Brookville	Dr. V. Z. Miller
Broughton	Mr. J. K. Sierer
Bryan	Mr. Nicholas Vineyard
Buckeye City	Mr. T. R. Nolden
Brink Haven	Mr. J. K. Butler
Burbank	Dr. M. H. Dodd
Butler	Dr. J. M. McLaughlin
Burton	Dr. B. F. Ray
Byesville	Mr. E. D. Trott
Cadiz	Dr. F. C. Clark
Caldwell	Dr. O. O. McKee
Caledonia	Mr. Noah Lee
Calais	Mr. Josiah Thomas
Cambridge	Mr. I. A. Oldham

Camden	Dr. John Whittaker
Canal Dover	Mr. Henry Breitenstine
Canal Fulton	Mr. J. Ford
Canal Winchester	Dr. W. S. Gayman
Canfield	Mr. A. D. Woods
Cardington	Mr. W. H. Van Horn
Carey	Dr. I. N. Zeis
Carroll	Dr. H. A. Brown
Carrollton	Dr. A. H. Hise
Carthage	Mr. Harry Ross
Catawba	Dr. T. D. Beach
Cecil	Mr. H. L. Weaver
Cedarville	Mr. David H. McFarland
Celina	Dr. L. P. Lisle
Centerburg	Mr. J. C. Coe
Chagrin Falls	Mr. I. N. Warner
Chardon	Mr. F. S. Pomery
Chatfield	Dr. Joseph H. Mollenkop
Chester Hill	Dr. J. A. Penrose
Chesterville	Mr. John Gleason
Chicago Junction	Dr. D. H. Young
Clarington	Mr. John E. Morrill
Clarksville	Dr. Z. T. Garland
Clarksburg	Dr. J. F. Simpkins
Clearport	Dr. J. T. Hufford
Cleves	Dr. W. C. Hughes
Clifton	Dr. J. H. Harris
Coalton	Mr. M. K. Glenn
Clyde	Mr. F. G. Tuttle
College Hill	Mr. E. F. Smith
Collinwood	Dr. P. E. Kerlin
Columbiana	Mr. George Roninger
Columbus Grove	Dr. W. H. Begg
Commercial Point	Mr. W. J. Rout
Conneaut	Dr. D. S. Cossitt
Continental	Mr. L. Rice
Convoy	Dr. R. L. Crooks
Coolville	Dr. A. M. Frame
Copley	Mr. O. E. Arnold
Corning	Mr. A. A. Bock
Cortland	Dr. K. W. Lynn
Coshocton	Dr. J. E. Foster
Covington	Mr. George Flammer
Crestline	Mr. A. J. Cover
Cridersville	Mr. Benjamin Bloyer
Croton	Dr. G. M. Lyman
Crooksville	Mr. E. U. Tatman

Cumberland	Mr. George E. McEndree
Custar	Dr. M. Woeline
Cuyahoga Falls	Mr. I. N. Reid
Cygnet	Mr. D. J. Baker
Dalton	Mr. A. H. Arick
Danville	Dr. C. R. Bradfield
Darbyville	Mr. M. N. Bowman
Deersville	Dr. Frank James
DeGraff	Mr. John W. Hendershott
Delta	Dr. W. E. Ramsey
Delhi	Mr. M. L. Andrews
Dell Roy	Mr. Wm. Clemens
Delphos	Dr. J. M. Marsh
Dennison	Dr. L. H. Hughes
Deshler	Dr. J. H. Lathrop
Dillons	Dr. G. B Trout
Donnelsville	Dr. Horace Heistand
Doylestown	Mr. A. E. Stepfield
Dresden	Mr. George Sparks
Dublin	Dr. L. McKitrick
Dunkirk	Dr. G. E. Starner
Dupont	Mr. A. Z. Bennett
East Cleveland	Mr. T. H. Bushnell
East Fairfield	Dr. G. H. Albright
East Palestine	Mr. W. H. Ollaman
Eaton	Mr. F. Campbell
Edgerton	Dr. C. Hathaway
Edison	Dr. J. H. Jackson
Edon	Mr. R. H. Chisholm
Eldorado	Dr. A. C. Carney
Elida	Mr. A. J. Myers
Elmore	Dr. S. T. Dromgold
Elyria	Dr. W. E Hart
Elmwood Place	Dr. E. T. Busching
Enon	Mr. Jas. P. Pierce
Fairfield	Mr. Samuel Wilson
Fairport	Mr. A. J. McCue
Fairview	Mr. John H. Hunt
Farmersville	Mr. George W. Neushawg
Fayette	Mr. W. O. Ford
Felicity	Mr. C. B. Altman
Fernbank	Mr. James E. Hickman
Fitchville	Dr. E. Burton
Fletcher	Dr. J. Funderburg
Flushing	Dr. A. B. Hobson
Forest	Dr. W. T. Gemmill
Fort Jennings	Dr. J. F. George

Fort Recovery	Mr. John Watkins
Fowler	Mr. C. D. Williamson
Frankfort	Dr. J. O. Hoffhine
Franklin	Dr. D. A. Williams
Frazeysburg	Mr. Wm. Host
Fredericksburg	Dr. D. P. Shie
Fredericktown	Dr. W. W. Pennell
Freeport	Dr. W. A. Zellars
Fultonham	Dr. C. B. Moore
Gahanna	Mr. Sam'l Cashner, Mayor
Gambier	Dr. A. D. Welker
Garrettsville	Dr. C. A. Snow
Geneva	Dr. G. G. Biggar
Genoa	Dr. J. K. Teetzell
Georgetown	Dr. A. W. Mitchell
Germantown	Mr. H. A. Smally
Gibsonburg	Mr. A. E. Ferguson
Gilboa	Dr. M. A. Darbyshire
Girard	Dr. D. R. Williams
Glandorf	Mr. Jacob Meyerhofer
Glendale	Mr. Clifford Allen
Glenville	Mr. Andrew Carr
Glouster	Dr. J. M. Rhodes
Good Hope	Mr. D. C. Somers
Grafton	Mr. Jos. Hartman, Sr.
Grand Rapids	Mr. Wm. Mailey
Grand River	Mr. Jas. Averille
Gratis	Mr. Alfred Johnson
Granville	Dr. O. J. Wood
Graysville	Rev. W. J. Raybould
Green Camp	Mr. W. C. Knickle
Greenfield	Mr. Scott Powell
Green Springs	Dr. H. L. S. Hinkley
Greenwich	Mr. F. L. Ward
Grove City	Mr. E. S. Grant
Grover Hill	Mr. G. H. Hays
Groveport	Dr. C. R. Clement
Hagermans	Dr. J. M. Deford
Hamden Junction	Mr. Geo. A. F. Smith
Hamler	Mr. N. J. Blinn
Hanging Rock	Mr. Joseph Kinkaid
Hanoverton	Dr. Geo. E. Lewis
Harmar	Mr. John W. Knox
Harrison	Dr. W. A. Axby, Sec'y
Harrisburg	Mr. C. H. Copeland, Clerk
Harrisville	Dr. G. H. Colvill
Harrod	Mr. C. S. Smith

Hartwell	Dr. O. W. Butler
Haskins	Dr. E. J. Greenfield
Harveysburg	Dr. J. E. Witham
Hayesville	Mr. Dill Andress
Hebron	Dr. B. F. Hawk
Herring	Dr. R. M. C. Hill
Hicksville	Mr. Nelson Smith
Higginsport	Dr. J. H. Doland
Hilliards	Dr. N. P. Davidson
Hillsborough	Dr. S. R. Howard
Holgate	Dr. C. M. Overhulse
Hollansburgh	Dr. A. W. Meek
Home City	Dr. B. F. Lehman
Holmesville	Dr. Edgar Cole
Hopedale	Dr. L. A. Crawford
Hubbard	Dr. W. H. Button
Hudson	Dr. Geo. L. Starr
Huntsville	Dr. J. S. Montgomery
Huron	Mr. S. N. Lennon
Hyde Park	Dr. John L. McLeish
Irondale	Mr. Alex. Hamlin
Independence	Mr. James C. Neville
Ithaca	Dr. J. C. Hamilton
Jackson	Mr. Henry Simpson
Jacksonville	Mr. John Stamm
Jackson Center	Dr. C. W. Moots
Jamestown	Mr. Elmer Stinson
Jefferson	Dr. A. L. Arner
Jeffersonville	Dr. D. H. Rowe
Jenera	Mr. C. H. Heldman
Jerusalem	Mr. J. A. Latham
Jerry City	Mr. U. Shasteen
Jersey	Dr. S. S. Richards
Jewett	Mr. J. R. Roberts
Johnstown	Dr. C. A. Burke
Johnsonville	Mr. E. C. Hitchcock
Junction City	Dr. J. E. Moody
Kalida	Mr. Jefferson Ladd
Kelley's Island	Dr. J. J. Klein
Kent	Mr. L. G. Reed
Killbuck	Dr. T. A. Ablett
Kimbolton	Dr. S. M. Mehaffey
Kingston	Dr. C. C. Hatfield
Kirby	Dr. E. E. Burns
Lakewood	Dr. A. E. McClure
Lakeview	Dr. V. F. Barrett
La Grange	Dr. G. N. Snyder

Larue	Mr. C. H. Topliff
Latty	Dr. J. A. Mouser
Laureiville	Mr. Berman Friend
Laura	Mr. W. S. Olvin
Lebanon	Mr. Thomas Starry
Leesburg	Dr. H. A. Beeson
Leetonia	Dr. H. B. Kurtz
Leipsic	Dr. John McClung
Lewisburg	Mr. E. E. Black
Lewisville	Mr. M. Y. Thornberry
Lexington	Dr. H. H. Smith
Liberty Center	Mr. D. K. Bowker
Lisbon	Mr. R. G. Eells
Lithopolis	Mr. E. S. Stotz
Lockington	Mr. Jacob Everly
Lockland	Dr. B. H. Timberman
Lodi	Mr. A. O. Nead
Logan	Dr. N. H. Blosser
London	Dr. M. Vance
Lorain	Dr S. S. Cox
Loramies	Dr. Thos. Walkup
Loudonville	Mr. Wm. Conrad
Louisville	Dr. C. A. Walker
Loveland	Dr. L. W. Bishop
Lowell	Mr. Willard H. Davis
Lowellville	Dr. J. H. McWilliams
Lower Salem	Mr. W. S. Williams
Lynchburg	Mr. C. A. Michael
Macksburg	Mr. R. C. Smithson
Madison	Dr. C. H. Quayle
Madisonville	Dr. C. L. Metz
Magnetic Springs	Dr. C. L. Schwartz
Magnolia	Mr. Wm. Judd
Maineville	Mr. E. S. Garwood
Malta	Mr. John Davis
Malvern	Dr. E. C. Ross
Manchester	Dr. J. D. Jordan
Marblehead	Mr. A. J. Clemons
Marseilles	Mr. John C. Wartley
Marshallville	Dr. H. B. Willford
Martinsville	Dr. W. K. Ruble
Marysville	Dr. Graily Henderson
Mason	Dr. C. T. Hall
Maumee	Mr. M. Dohr
Marengo	Mr. Edgar Kerr
McArthur	Mr. David Lantz
McClure	Mr. James A. Randolph

McComb	Dr. J. A. Howell
McConnelsville	Mr. Wm. Dilley
McGuffey	Dr. J. B. K. Evans
Mechanicsburg	Dr. W. H. Fuert
Mechanicstown	Dr. John M. Watt
Medina	Mr. A. A. Foskett
Melrose	Mr. T. J. Myers
Mendon	Dr. J. M. Miller
Mentor	Dr. Lester H. Luse
Metamora	Dr. C. Heffron
Midland City	Dr. E. C. Van Gundy
Middleport	Dr. David Sisson
Miamisburg	Dr. Henry Schoenfield
Milan	Mr. Richard Rawl
Milford	Dr. F. C. Curry
Milford Center	Mr. Joseph Snyder
Miltonsburg	Dr. J. H. Pugh
Milton Center	Dr. J. F. Noble
Milledgeville	Dr. James Cowan
Millers	Mr. M. McCown
Millersburg	Mr. C. J. Fisher
Mineral Ridge	Mr. Thomas J. Jenkins
Minerva	Mr. Thomas J. Rouch
Mingo Junction	Mr. F. S. Buchanan
Minster	Dr. R. A. Rulmann
Monroeville	Dr. E. R. Kreider
Montpelier	Dr. H. W. Wertz
Morristown	Mr. R. S. Hazlett
Morrow	Dr. Benjamin F. Stiles
Moscow	Mr. J. R. Wiley
Mt. Blanchard	Dr. J. Odenbaugh
Mt. Cory	Dr. W. E. Clymer
Mt. Healthy	Mr. Frederick Walker
Mt. Gilead	Mr. G. W. Jackson
Mt. Pleasant	Mr. Thomas P. Gorsuch
Mt. Orab	Dr. R. H. Trimble
Mt. Washington	Dr. J. W. Dodds
Mt. Victory	Dr. A. N. Titsworth
Murray City	Dr. T. J. Dillinger
Mutual	Mr. C. M. Goul
Napoleon	Mr. O. E. Barnes
Nashport	Mr. H. L. Curtis
Nashville	Mr. David Parks
Navarre	Mr. John Bailiss
Nelsonville	Dr. C. E. Welch
Nevada	Dr. S. S. Barrett
Neville	Dr. N. S. Hill

New Albany	Dr. C. L. Dolle
New Athens	Dr. Albert Dickerson
Newburgh	Mr. Chas. Radcliff
New Bremen	Dr. M. S. Ekermeyer
New Burlington	Dr. U. G. Murrell
New Carlisle	Mr. G. W. Pierce
Newcomerstown	Dr. J. R. McElroy
New Concord	Mr. J. W. McKinney
New Holland	Mr. Samuel McGath
New Knoxville	Dr. H. E. Fledderjohn
New Lebanon	Mr. Samuel Bowman
New Lexington	Mr. Lawrence Keating
New London	Mr. A. M. Turner
New Madison	Mr. J. F. S. Hageman
New Matamoras	Mr. Theodore Heddleston
New Paris	Dr. Louis Dunn
New Philadelphia	Dr. George H. Peck
New Richmond	Dr. J. A. Windsor
New Riegel	Mr. Peter Trausch
New Straitsville	Mr. Thomas Taylor
Newton Falls	Mr. A. C. Lawton
New Vienna	Dr. George R. Conard
New Washington	Mr. George B. Wolf
Ney	Dr. P. M. Lehman
Niles	Dr. C. C. Williams
North Amherst	Dr. N. H. Cornwell
North Baltimore	Dr. J. W. Storer
North Hampton	Dr. E. B. Davis
North Lindale	Mr. H. Gearley
North Lewisburg	Mr. A. Spain
North Robinson	Mr. J. Robertson
Norwich	Mr. L. D. Wilson, Sec'y
Norwood	Dr. J. C. Cadwallader
Oak Harbor	Dr. F. S. Heller
Oak Hill	Mr. Wm. W. Morgan
Oakwood	Mr. W. E. Osborne
Oberlin	Mr. E. L. Burge
Ohio City	Mr. E. B. Grunden
Olmstead Falls	Mr. W. B. Locke
Orrville	Dr. A. A. Brooks
Osborne	Dr. R. O. Hoover
Osgood	Mr. J. W. Sprague
Osnaburg	Dr. W. D. Davis
Ostrander	Dr. A. J. Pounds
Ottawa	Mr. Frank Light
Ottoville	Dr. A. Binder

Otway	Mr. Alfred Jones
Owensville	Dr. G. G. Rutledge
Oxford	Mr. J. T. Preston
Patterson	Mr. Peter Bradenbaugh
Painesville	Mr. G. M. Cranston
Pataskala	Mr.Frank McConnaughey
Paulding	Dr. J. U. Fauster
Payne	Dr. J. E. Mulligan
Peebles	Dr. O. W. Robe
Pemberville	Mr. Henry E. Long
Peninsula	Dr. W. N. Boerstler
Perrysburg	Dr. J. H. Reinfrank
Perrysville	Dr. George W. Shehan
Philo	Dr. J. H. Green
Piketon	Dr. A. F. Bumgarner
Pioneer	Mr. W. G. Copley
Plain City	Dr. J. S. Howland
Plainfield	Mr. I. D. Parker
Pleasant Hill	Dr. A. J. Bausman
Pleasant Ridge	Mr. C. W. Acomb
Pleasantville	Dr. W. E. Baker
Plymouth	Dr. Jerry M. Garber
Poland	Dr. C. R. Justice
Polk	Dr. W. H. Rhinehart
Portage	Mr. Jos. Close, Member Board of Health
Port Clinton	Dr. Paul de la Barre
Port Jefferson	Dr. S. S. Crumbaugh
Port Washington	Mr. M. W. Nargney
Port Williams	Mr. S. L. Thorpe
Powhatan Point	Mr. Franz Saner
Proctorville	Dr. W. W. Reynolds
Prospect	Dr. C. M. C. Thomas
Put-in-Bay	Mr. Hugo Steiert
Quaker City	Dr. F. S. Miskimen
Quincy	Mr. R. T. Cretcher
Racine	Dr. C. M. Hyman
Rarden	Dr. R. A. Foster
Rawson	Mr. Michael Smith
Ravenna	Mr. Lee W. Wood
Reading	Mr. Riley Murphy
Republic	Dr. F. C. Gilcher
Reynoldsburg	Dr. F. G. Taylor
Richmond	Dr. Samuel Rothacker
Richwood	Mr. F. L. Perry
Ridgeway	Dr. E. B. Crow
Ripley	Dr. T. H. B. Norris
Rising Sun	Mr. C. A. Bates

Rochester	Dr. J. C. Dignan
Rock Creek	Dr. W. S. Weiss
Rocky Ridge	Mr. Wm. Schlegel
Rogers	Mr. C. T. McArtor
Roseville	Mr. J. H. Wolff
Rushylvania	Dr. J. G. Sutton
Rushville	Dr. W. G. Lewis
Sabina	Mr. Jared L. Johnson
Salesville	Mr. W. E. McKinley
Salineville	Mr. James Carter
Sarahsville	Dr. W. S. Williams
Scio	Mr. L. O. Rippeth
Scott	Mr. T. J. Lewellyen
Sedalia	Dr. E. B. Mead
Senecaville	Dr. W. Scott
Seville	Dr. P. E. Beach
Shawnee	Dr. E. C. Mann
Shelby	Dr. W. S. Anderson
Sharon	Mr. J. A. Reid
Sherodsville	Dr. J. B. Aldridge
Sherwood	Dr. H. C. Lindersmith
Shiloh	Dr. S. S. Holtz
Shreve	Mr. J. D. Barcus
Sidney	Mr. Wm. C. Wyman
Smithfield	Dr. Wm. H. Wood
Smithville	Dr. W. H. Morgan
Somerset	Mr. Frank Sutton
Somerville	Mr. L. W. Randall
South Bloomfield	Dr. C. E. Blacker
South Charleston	Dr. C. A. Grahn
South Lebanon	Dr. S. Lambright
South Point	Dr. James Black
South Salem	Dr. E. C. Lumbeck
Sparta	Mr. S. G. Fowls
Spencerville	Mr. Charles H. Baum
Springboro	Mr. J. B. Haines
Spring Hills	Mr. Quincy T. Eleyet
Spring Valley	Mr. Arch Copsey
St. Bernard	Dr. B. Poulscamp
St. Clairsville	Dr. D. L. Walker
St. Marys	Dr. B. E. Thomas
St. Paris	Dr. C. A. Offenbacher
Stewart	Mr. G. H. Hawk
Stockport	Mr. M. C. Riley
Strasburg	Dr. J. C. Schultzbach
Stouts	Dr. S. B. Grimes
Stryker	Mr. George Snyder

Summerfield	Mr. John E. Mosely
Sugar Grove	Dr. S. Renshaw
Sunbury	Dr. G. H. Gerhardt
Swanton	Dr. W. A. Scott
Sycamore	Mr. R. S. Galleher
Sylvania	Mr. G. A. Crandall
Tarlton	Mr. J. B. Grove, Clerk
Taylorsville	Mr. Jos. H. Green
Tippecanoe City	Mr. Esta S. Smith
Tiro	Dr. W. H. Guiss
Thornville	Dr. W. T. Stevens
Thurman	Dr. Gomer E. Jones
Tontogany	Mr. R. J. Collin, Mayor
Toronto	Dr. W. L. Carroll, Sec'y
Trimble	Dr. H. D. Danford
Trinway	Mr. Leroy Rose
Tuscarawas	Mr. M. A. Romig, Mayor
Union City	Mr. Jas. F. Bolen
Uhrichsville	Dr. J. A. McCollam
Utica	Dr. G. W. Garrison
Upper Sandusky	Dr. G. O. Maskey
Vandalia	Dr. W. H. Riley
Vanlue	Dr. Jas. L. Schrotz
Van Wert	Dr. E. L. Wilkinson
Vermillion	Mr. J. W. Boss
Versailles	Dr. Wm. C. Gutermuth
Vinton	Mr. R. B. Carter
Wadsworth	Dr. C. N. Lyman
Waldo	Dr. J. R. Hipple
Wapakoneta	Mr. A. Kohler
Warsaw	Mr. S. W. Willis
Washington	Mr. S. B. Lawrence
Washingtonville	Dr. H. C. Seifert
Waterville	Dr. Samuel Downs
Wauseon	Dr. J. H. Waddell
Waverly	Mr. Geo. E. Emmitt
Waynesburg	Mr. E. G. McCormick
Waynesfield	Mr. F. M. Berry
Waynesville	Dr. W. E. Oglesbee
Webster	Mr. J. F. Byrd
Wellington	Mr. D. M. Hall
West Alexandria	Mr. W. W. Crouse
West Cairo	Dr. Geo. W. Henderson
West Carrollton	Mr. J. B. Manly
West Elkton	Dr. Elwood Holaday
Westerville	Mr. Jas. D. Budd
Western Star	Mr. P. A. Johnson

West Jefferson	Mr. W. R. Borland
West Leipsic	Mr. M. L. Pritchard
West Liberty	Dr. R. M. Fulwider
West Manchester	Mr. David E. Allen
West Mansfield	Dr. J. W. Arbegast
West Milton	Dr. Gainor Jennings
West Salem	Dr. D. W. Carver
Weston	Dr. G. B. Spencer
West Union	Dr. W. K. Coleman
West Unity	Mr. J. H. Tiddler
White House	Mr. W. K. Jones
Wilkesville	Dr. E. M. Dixon
Williamsburg	Dr. Isaac Redrow
Williamsport	Dr. G. C. Hayes
Windham	Mr. H. J. Higby
Willoughby	Dr. Geo. B. Durban
Willshire	Dr. J. F. Shaffner
Wilmington	Dr. A. T. Quinn
Winchester	Mr. Alfred Johnson
Winton Place	Dr. E. H. Johanning
Woodsfield	Mr. A. S. Baker
Woodstock	Mr. Oliver Ewing
Woodville	Mr. F. L. Nieman
Worthington	Dr. D. H. Welling
Wyoming	Mr. Geo. Stoddard
Yellow Springs	Dr. Wm. M. Haffner
Zoar	Mr. C. F. Sylvan

ANNUAL REPORTS

OF

LOCAL BOARDS OF HEALTH

FOR THE

YEAR ENDING DECEMBER 31, 1898.

ANNUAL REPORTS OF LOCAL BOARDS OF HEALTH

Ohio State Board of Health,
Office of the Secretary,
Columbus, Ohio, December 31, 1898.

To the Health Officer:

Dear Sir: Will you please furnish the State Board of Health with a report of the operations of your board of health during the year ending December 31, 1898.

Kindly use the blank space following for your report, being as brief as clear statements will allow.

We wish to know particularly the present sanitary condition of your city or village, and whether your board has maintained an active organization and been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances.

The following points are suggested:

Sanitary Condition—Are streets, alleys and yards in a cleanly condition? Is there cause for complaint from the lack of sewerage, or from an improper discharge of sewage? Are there nuisances which the board has unsuccessfully tried to abate? If so, what is their nature? What arrangements are made for the removal and disposition of night-soil and garbage?

Contagious Diseases—Are contagious diseases properly reported? Is a record of such diseases kept? Has the board been able to enforce proper restrictive measures? What contagious diseases have been more prevalent than usual? Give estimated number of persons vaccinated during the year? Please ascertain from superintendent of schools, if possible, and state the number of unvaccinated children attending public and parochial schools.

The Board of Health—How many meetings has the board of health held during the year? Give total amount spent by board of health for the year. Give the number, character and results of any prosecutions brought by the board of health for violations of its orders or of health laws. Have you any suggestions to offer for improving the form or character of our present health boards?

Please return your report at the earliest possible time, in order that it may be included in the next annual report of the State Board of Health.

Very respectfully,

C. O. Probst, M. D.,

By order of the Board. *Secretary.*

ANNUAL REPORTS OF LOCAL BOARDS OF HEALTH.

ADA, HARDIN COUNTY.

W. H. Morrow, health officer.

Population (estimated), 3,000.

The town is in good sanitary condition. There have been no complaints from lack of sewerage or improper discharge of sewage. The board has not been unsuccessful in trying to abate nuisances. Garbage wagons are used for the removal and disposal of night-soil and garbage.

Contagious diseases are properly reported and a record is kept of such. The board has been able to enforce proper restrictive measures. We had an epidemic of scarlet fever in a mild form—no serious cases Not often reported to doctor, and it became general before the health authorities were aware of its existence. So far as known there has been no vaccination during the year. Four hundred children attending the public schools are unvaccinated.

The board held six meetings during the year. Total amount of money spent, $35. No prosecutions were brought for violation of the health laws.

Infectious diseases reported during the year: Diphtheria, 4 cases; typhoid fever, 11 cases.

ADDYSTOWN, HAMILTON COUNTY.

Hugh Kennedy, health officer.

Population, about 1,500.

Last spring the mayor appointed a new health board. They have had no meetings, for it seems they cannot get together, for what reason I do not know. There has been no prosecutions, and there is no expense that I know of with the exception of my little salary of $5 per month. The place is in a pretty good condition considering that half the population are negroes, and as a general thing they are not very cleanly. Not much interest is taken in the cause of good health.

Infectious diseases reported during the year: Diphtheria, 3 cases.

AKRON, SUMMIT COUNTY.

Dr. E. S. Underwood, health officer.

Population (estimated), 40,000.

Sanitary condition of city good. Sewerage system good, but somewhat limited. Night-soil removed and buried, as per State law.

There is a private garbage furnace—furnish cans and remove contents two and three times a week at a cost of 15 cents a week.

Contagious diseases are reported, as a rule, promptly and recorded. No more contagion than usually reported. Board meets the first and third Fridays of each month. Three arrests made for selling diseased meat; fined $25 and costs each. Total expense has been $2500

Infectious diseases reported during the year: Diphtheria, 40 cases; membranous croup, 8 cases; scarlet fever, 51 cases; typhoid fever, 18 cases; whooping cough, 18 cases; measles, 337 cases.

ALLIANCE, STARK COUNTY.

Dr. P. W. Walker, health officer.

Population (estimated), 8,000.

No report.

Infectious diseases reported during the year: Scarlet fever, 1 case; typhoid fever, 8 cases.

ALGER, HARDIN COUNTY.

Dr. R. F. Coppers, health officer.

Population, under 500.

We have complained of lack of sewerage of the C. & E. R. R., which causes a change in water course and overflows the town.

ANNA, SHELBY COUNTY.

C. W. B. Harbour, M D., health officer.

Population (estimated), 900.

Our village is in a good sanitary condition. Contagious diseases are not reported. Record is kept when reported. Follicular tonsillitis and measles are the only contagious disease prevalent during the year. Number of persons vaccinated 15. About 140 unvaccinated children in the public schools. No meetings this past year. No money spent. No prosecutions.

The only suggestion is—I think it is demanded, for the safety of our people and in having the laws of the health board properly carried out; to have a superintendent of the board in each county to receive pay as coroner or sheriff. When called out, as in most instances, the health officer is a practicing physician or some other man in business, which intimidates him, causing him to favor his patrons or friends, and uses leniency to protect them and jeopardizes the health of all others. When if a superintendent was appointed or elected for that purpose, the people would feel then that the law must be recognized and would act accordingly, and the office would be compelled to act.

ARCADIA, HANCOCK COUNTY.

Addison Huffman, health officer.

Population (estimated), 500.

I have no way of getting a report for 1898, as we only organized our board of health the last days of December, and had nothing reported to me in 1898, but would say that our board has maintained an active organization and been successful in enforcing proper measures for the prevent tion of contagious diseases.

ARCANUM, DARKE COUNTY.

Dr. E. B. Hawley, health officer.

Population (estimated), 1,600.

We have a thorough organization. Sanitary condition is good. Sewerage is not as good as it should be. We have been very successful in enforcing proper measures for the prevention of contagious diseases. There is a nuisance we, as a board, have been trying to have removed, and that is the keeping of hogs in the city limits. We have appealed to the council time and again, but they pass it by unheeded. All contagions are properly reported. There has been no vaccinating in our city for the last five years. One hundred and fifty children not vaccinated in our public schools. We have had four meetings since April 1, 1898. We have had no trouble to enforce law.

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 2 cases; typhoid fever, 8 cases; whooping cough, 2 cases; measles, 4 cases.

ARCHBOLD, FULTON COUNTY.

August Ruihley, health officer.

Population (estimated), 900.

Streets and alleys are in fair condition. The sewers of our village empty in open railroad ditch. Night-soil is removed by a scavenger.

Contagious diseases not always reported. Our town has been very free from contagion for the past year.

No persons vaccinated during the year to my knowledge

Board of health met about six times. I have this to suggest, make the office elective. Men seek office when there is an excitement about getting elected. Men do not like gifts unless they are valuable.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 2 cases.

ARLINGTON, HANCOCK COUNTY.

W. D. Sebastian, health officer.

Population (estimated), 300.

The board has maintained an active organization. Streets, alleys, yards fairly cleaned. Night-soil is buried. Contagious diseases are not always reported. Scarcely any of the youths are vaccinated. The board of health has met once each month. Expenses $20; prosecutions none.

ASHLAND, ASHLAND COUNTY.

Dr. D S. Sampsel health officer.

Population (estimated), 4,500.

Health board has maintained an active organization with health officer, sanitary officer, president, secretary and clerk, including six members on board of health, and has been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of all nuisances.

Sanitary condition—Streets, alleys and yards in a cleanly condition.

We have a lack of sewerage. No nuisances which the board has not successfully abated. We have no arrangements for the disposal of garbage.

Contagious diseases are properly reported and a record kept of the same.

The board has been able to enforce proper restrictive measures.

Tonsillitis has been the most prevalent disease. Nearly everybody, so far as I can learn, has been vaccinated, both children and adults. Board of health meets the first Tuesday of every month.

Total amount spent during the year by the board of health, $400. No prosecutions brought by the board of health for violation of its orders.

I have no suggestion to offer for improving the force and character of our present health boards.

In my opinion our town is very much in need of a good sewerage system, and, also, a system to take care of garbage.

Infectious diseases reported during the year: Scarlet fever, 25 cases; typhoid fever, 3 cases; whooping cough, 25 cases; measles, 2 cases.

ASHLEY, DELAWARE COUNTY.

Dr. H. N. Coomer, health officer.

Population (estimated), 800.

The sanitary condition of Ashley is good. We have had no serious epidemic of infectious or contagious diseases. Measures for the prevention and abatement of nuisances, when notified of their existence, are promptly and effectively used without a resort to coercive measures.

Our streets, yards and alleys are in good condition. We have no permanent arrangement for the removal and disposition of night-soil. The business should be in the hands of a contractor.

The reports of contagious and infectious diseases, and the reports of births and deaths, are not properly reported yet physicians are furnished with blanks for the purpose at the expense of the corporation.

A record of contagious and infectious diseases is kept, and also of births and deaths.

Number of unvaccinated pupils attending Ashley schools, 179.

Estimated number of persons vaccinated the past year, none.

The number of meetings held by the board of health the past year, as reported by the clerk of the board, five. At the last meeting of the board I urged the importance of sending delegates to the meeting of the State and local boards of health in January, the present month. I regret to say that such a measure was considered by the board as an unnecessary expense. The infirmities of 82 years, including deafness, will prevent my attendance.

I suggest that our board of health be entirely reconstructed and required to meet on a separate night (or day) than the time fixed for our council meeting.

Total amount spent by the board of health for the year, $26.

Infectious diseases reported during the year: Typhoid fever, 4 cases; measles, 1 case.

ASHVILLE, PICKAWAY COUNTY.

John Johnson, health officer.

Population (estimated), 800.

Sanitary condition of our village is excellent. We now have a splendid system of sewerage by the addition the past summer of a 30-inch sewer, draining what ha heretofore been the worst thing we have had to combat with. We spent the past year on this sewer and the necessary connections, $1,300, and point with pride to the fact that not a single case of any contagious disease has existed in our village the past summer, while previous to the construction of this sewer the district through which it runs was always the place where these diseases existed. Ou health officer is always on the alert for the discovery of any existing nuisance, and at once adopts means necessary for the abatement of them. The cleanliness of our streets is pointed to by all strangers visiting us. They say no town in Ohio of equal size is better kept than Ashville.

Our health board has had but few meetings during the year. Yet we have a good organization. The limited number of deaths in our village from all causes is one strong proof that our sanitary make-up is good. A prospect now exists of the location, just outside our limits, of a mammoth canning factory which, if so located, may claim the attention of the health board frequently, for as a rule such places are not always in the best sanitary condition. If so located and they become a nuisance our council will see that the village limits extend beyond the territory they occupy.

ATHENS, ATHENS COUNTY.

Dr. J. L. Henry, health officer.

Population (estimated), 3,500.

Our streets, alleys and yards are in good condition. The sewer system does not extend to all the town, but it is being extended every year, and we will soon have no cause for complaint on that ground.

The board has been successful in the abatement of all nuisances that it has attempted to abate.

Night-soil is removed after 10 P. M., taken to country, spread and plowed under. We have a garbage dump about a half-mile from the corporate limits.

Contagious diseases are promptly reported, quarantine restrictions enforced, and record kept of all cases.

The number of persons vaccinated during the year has not exceeded probably 30. The number of unvaccinated children is large, for vaccination has not been enforced since 1892 and 1893.

The board of health held 15 meetings in 1898 and has spent $250.

Infectious diseases reported during the year: Scarlet fever, 1 case; measles have been epidemic.

AINBRIDGE, ROSS COUNTY.

R. H. McKee, M. D., health officer.

Population (estimated), 1,000

Streets, alleys and yards are in a cleanly condition No complaint in regard to sewerage. The board has abated all nuisances except hog pens. No arrangement for the removal of night-soil.

Contagious diseases are reported by all the physicians but one, who refuses to report them. A record is kept of cases reported, and restrictive measures enforced.

Measles have been more prevalent than usual.

No persons vaccinated. No vaccinations for years.

Board held two meetings during the year. Board has probably expended $15 during the year. No prosecutions.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 1 case; typhoid fever, 4 cases; measles, 90 cases.

BAKERSVILLE, COSHOCTON COUNTY.

Dr. C. R. Kitsmiller, health officer.

Population (estimated), 400.

We have abated several nuisances, such as vaults, hog pens and cleaning well and cesspools.

Contagious diseases have been very scarce in our territory.

Attending physicians are not as prompt in reporting cases as they should be.

No prosecution has been brought.

There has been no vaccinations, and most of the school children are not and never have been vaccinated.

Have made no settlement for year; do not make same till April. About $10 will cover all.

There is not the interest manifested in board that there should be.

BARBERTON, SUMMIT COUNTY.

Dr. C. H. Whipple, health officer.

Population (estimated), 3,000.

Much complaint from improper discharge of sewers.

Contagious diseases are properly reported.

Board has held 16 meetings.

Total amount of expenditures by the board $180.

Whole number reported concerning vaccination, 476; whole number vaccinated, 229; whole number of effectual vaccination, 181; whole number of not effectual vaccination, 48; whole number not vaccinated, 247.

Infectious diseases reported during the year: Diphtheria, 8 cases; membranous croup, 1 case; scarlet fever, 3 cases; whoop-cough, 3 cases; measles, 3 cases.

BARNESVILLE, BELMONT COUNTY.

W. A. Talbott, health officer.

Population (estimated), 4,000.

The sanitary condition of our town is reasonably good, excepting for discharge of sewage on streets and alleys. This is the source of much complaint, and is the exceptional nuisance that the board has not been able to control.

The removal of garbage and night-soil is provided for by a resolution of the board of health, requiring persons in this business to take out a permit.

Contagious diseases have been properly reported, excepting typhoid fever. Our physicians ignore this requirement.

No record of such diseases is kept, except as it appears upon the journal in the health officer's monthly report.

No one vaccinated during year to my knowledge.

Number in school not successfully vaccinated, 389; absent and not reported, 48; present enrollment, 729; number meetings held by board, 15; amount spent by board, $130.

Three arrests were made for improper removal of night-soil. Offenders were required to correct the offense.

Have no suggestion to offer for improvement of health boards as now constituted. Would favor their abolition in villages. The village council could as well adopt all necessary sanitary measures, appoint an efficient health officer to enforce them, thus removing much friction that exists under present system, since boards of health, village councils and health officers rarely work in harmony.

Would enlarge authority of the health officer and make him responsible to council for efficient service.

I know of no good reason for retaining our present system, but much for its removal.

Infectious diseases reported during the year: Scarlet fever, 3 cases; typhoid fever, 4 cases; measles, 33 cases.

BARNHILL, TUSCARAWAS COUNTY.

John Stevenson, health officer.

Population (estimated), 1,100.

It is three months since our board organized, and a great improvement has been the result. Twenty-seven new privy vaults have been dug and put in a sanitary condition.

Our board meets the second Monday in each month and oftener if called upon.

The streets and alleys are very much improved since we have organized.

When they do not comply with the orders of the board they are brought before the mayor of the village.

Contagious diseases are properly reported. Only about 4 per cent. of children attending school vaccinated.

For the three months ending December 31, five meetings were held. The total cost of said board for the two months ending December 31, $26; for salary of health officer, clerk and stationery, $3 64.

On December 26, one Mollie Beans, was arrested for not complying with orders of board of health. Plead guilty. Mayor reprimanded her, as it was the first case and paid the costs. It worked good to others as an example.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 1 case; measles, 1 case.

BATESVILLE, NOBLE COUNTY.

W. K. Cooper, health officer.

Population (estimated), 400.

No report except contagious diseases.

Infectious diseases reported during the year: Typhoid fever, 1 case; whooping cough, 29 cases; other infectious diseases, 20 cases.

BEDFORD, CUYAHOGA COUNTY.

Louis C. Whitaker, health officer.

Population (estimated), 1,500.

General sanitary condition is fair. There is, however, a total lack of sewerage proper. No sewers exist, except "storm water" sewers. Several of these are partly open, and in some cases water closets are placed over these. Several have been removed by board, but more exist. A nuisance which board has been unable to abate is stable of R. K. Orchard. Rains carry material from same onto Main street, and it is at times very offensive. The situation as to garbage was reported by mayor, November 30, 1898. Owing to construction placed on letter from State board of October 2, 1898, to Mr. Neitzel, nothing has been accomplished on this.

Contagious diseases are generally properly reported. No record is kept, except health officer files report cards. Village has not supplied record books. Great opposition to quarantine. The enforcement is a continuous struggle, and it has not been as effective as desired. Scarlet fever most prevalent. Board has not vaccinated any persons, as the sentiment here is anti-vaccination, and any compulsory vaccination would be wasted. Superintendent of schools reports about one-half of school children not vaccinated.

Board of health held meetings since April, 1898 (present mayor's term). Total levy for sanitary purposes about $75. Board has spent about $100, thus anticipating on next year. No prosecutions for violation of health laws. Sentiment here is so strongly against such measures that same would be useless, and larger expense incurred. As to laws, sections 2133 and 2134, milk inspection is of no value, as health officer has no jurisdiction *outside village* to enter any premises This should be amended or section repealed, as the dairies here are all outside village. Section 2134 also applies only to villages. The power should be extended to township boards. Section 3986 seems to give school board power of compulsory vaccination. Section 2135 does not give that to local board, but by 3986 board of health must furnish materials. The local board of health has not sufficient funds, but school board has, but declines to use same. Local health board declines to furnish, claiming compulsory vaccination unconstitutional. The Act 87, v. 376 [Bates, (2141-1)], providing for abolishing boards of health should be upheld, or sanitary authority of board confined on council or its committee. As Sec. 2113 vests these powers in a board of health, the "sanitary committee" would not have them. Section 2142 should be amended so as to give city or village or township same authority in regard to dump grounds, garbage grounds, etc., that they have in matter of quarantine grounds. This is very important, as we find no authority to acquire garbage dump grounds by purchase. The laws for suppression of nuisances are too vague. It should be certain what powers can be exercised by health officer and what by health board.

Infectious diseases reported during the year: Diphtheria, 2 cases; scarlet fever, 16 cases; measles, 50 cases.

BELLAIRE BELMONT COUNTY.

Dr. D. W. Boone, health officer.

Population (estimated), 10,000.

Streets and alleys are kept in cleanly condition. Most alleys and streets brick paved, making them easy to clean. Lack sewerage in Horn's addition, Fourth ward. Night-soil is removed by private contract and dumped in holes out of corporate limits.

Infectious diseases reported during the year: Diphtheria, 30 cases; membranous croup, 7 cases; scarlet fever, 54 cases; typhoid fever, 95 cases; whooping cough, 86 cases; measles, 24 cases.

BELLEFONTAINE, LOGAN COUNTY

Dr. R. W. Chalfant, health officer.

Population (estimated), 8,000.

Streets, alleys and yards are in good condition. No sewerage, but should have. No trouble to abate nuisances, as we have had them. Garbage dumped outside of city.

Contagious diseases all must be reported, and a record of such are kept. The board has been able to enforce proper restrictive measures. Measles as you will notice by my report. About one thousand children were vaccinated, and all children attending school had to have a certificate from physician. Eight meetings of board of health during year.

The amount of money spent during year was about $325.

Infectious diseases reported during the year: Diphtheria, 5 cases; scarlet fever, 14 cases; typhoid fever, 10 cases; whooping cough, 1 case; measles, 129 cases.

BELLEVUE, HURON COUNTY.

John Battie, health officer.

Population (estimated), 4,500.

Streets, alleys and yards are in a cleanly condition. There has been no complaint from lack of sewerage or improper discharge of sewage. The board has been successful in abating nuisances. Night-soil and garbage are removed two miles from the city limits. Contagious diseases are properly reported and record is kept of them. The board has been successful in enforcing proper restrictive measures.

The board held six meetings during the year.

Infectious diseases reported during the year: Diphtheria, 11 cases; membranous croup, 2 cases; scarlet fever, 1 case.

BELMONT, BELMONT COUNTY.

David S. Pierce, health officer.

Population, (estimated), 600.

This is a very healthy place. We have pure water and plenty of it. Bored wells tiled to the rock, usually 78 feet. Town on hillside; need little tile or drainage. Streets and alleys usually clean.

BENTON RIDGE, HANCOCK COUNTY.

Reuben D. Whisler, M. D., health officer.

Population (estimated), 500.

The sanitary condition of the village is above the average for towns of its class. The board has been very vigilant in the suppression of any contagious disease which has come to their knowledge. All orders of the board have been fairly well obeyed. We have made no arrangements for the removal of night-soil.

All contagious diseases have been reported properly and a record kept of them, but the board has not as yet made a purchase of the necessary books.

During the year German measles was the prevailing contagious disease.

There have been no vaccinations. Only two children of the 130 who attend school have been vaccinated.

The board held seven sessions during the year. The total amount expended for quarantining cases — which include all expense—was $20.

Infectious diseases reported during the year: Scarlet fever, 1 case; typhoid fever, 2 cases; other [illegible]ious diseases, 10 cases

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BETHEL, CLERMONT COUNTY.

Julius D. Abbott, M. D., health officer.

Population (estimated), 800.

The board of health has not met regularly—only a few times in the last year. The sanitary condition of the village is fair, considering our drainage is all surface drainage. The streets and alleys are well kept and the orders of the board of health are generally obeyed without a murmur. Of course, we have a few very ignorant, who cause a little trouble. Yet much more could be done for the health of the village if the council will not expect the health officer to look to the wells, pig pens, privies and weed-grown alleys and back yards for almost nothing. Night soil is usually buried on the lot it belongs to. The privies usually have no vaults but are on the surface, and are usually cleaned often and dust or lime used.

There have been no contagious diseases reported the past year, in fact we have had good health, still I do not believe all diseases or deaths are reported to this board which occur in this village.

There has been no vaccination in the past year. I cannot get the number vaccinated.

The cost to the village per year for a board of health in the past is $10. But the board has reorganized and promises to be more efficient in the future.

In addition I would like to say I think the board of health of villages and the trustees of townships, who are boards of health for the country outside of villages, should have some law by which they could be held closer together. Last year, outside of the corporation limits in the township proper, were several cases of typhoid fever, scarlet fever, measles, mumps, and perhaps a half dozen cases of diphtheria. Now, the trustees seem willing to do but seem uninstructed, and there are no reports made to them and no official knowledge is carried on between village and township. Burial permits are not required. Births and deaths are not officially recorded.

BLAKES MILLS, TUSCARAWAS COUNTY.

Edward Steinbaugh, health officer.

Population (estimated), 500.

No report.

BLOOMDALE, WOOD COUNTY.

E. Wineland, health officer.

The board had one meeting in 1898 nothing done. Cannot get the board to meet. The sanitary condition of the town is not very good.

BLOOMINGBURG, FAYETTE COUNTY.

L. Dellinger, health officer.

Population (estimated), 800.

Streets, alleys and yards are in a cleanly condition. No complaint has been made about lack of sewerage or improper discharge of sewage. The board was successful in abating nuisances. Night-soil and garbage are removed one and one-half miles from town.

Contagious diseases are properly reported and a record kept. The board has been able to enforce proper restrictive measures. Chicken-pox has been more prevalent than usual. The estimated number of persons vaccinated is seven.

Three meetings have been held during the year. Total amount of money spent is $30. I would suggest that boards of health be paid, then they would meet regularly.

Infectious diseases reported during the year: Typhoid fever, 3 cases; whooping cough, 1 case; measles, 21 cases; chicken-pox, 13 cases.

BOND HILL, HAMILTON COUNTY.

D. Edw. Murphy, health officer.

Population (estimated), 1,100.

The streets, alleys and yards, etc., are in good condition, considering we have no sewerage system.

As to contagious diseases the strictest precaution is always used to prevent spreading. A record is kept in reference to same.

The board held four meetings the last year.

Infectious diseases reported during the year: Diphtheria, 2 cases; typhoid fever, 1 case; whooping cough, 15 cases; measles, 17 cases; other infectious diseases, 8 cases.

BOWERSVILLE, GREENE COUNTY.

C. E. Miars, health officer.

Population (estimated), 450.

The board of health of this village has met with considerable opposition in endeavoring to enforce the law, but have only failed in one instance. But that failure has had a bad effect upon some of the members of said board. The following is a summary of the case:

The board of education procured a building to hold public school in that was in a very unsanitary condition, especially the surroundings, and the board of health notified the board of education of the facts and causes existing, but they ignored the action of the board of health. Consequently the board of health passed resolutions setting forth the causes, and that the holding of school in that place would be inimical to the health of the small children, and also notifying board of education the second time, but they ordered school commenced, but the orders of the board of health were (in the resolutions passed), if the board of education attempted to take up school in said building to lock the door against them, and the door was locked. Then the president of the board of education telephoned the prosecuting attorney (who was a *special* friend of his) to file a petition in common pleas court for an injunction, alleging many things that were untrue. The injunction was temporarily granted. Nine hours from the time the door was locked the sheriff served summons on the board of health. Then in two or three days enough of the board of education confirmed the action of the president, and passed a resolution dictated by our prosecuting attorney, said resolution containing the facts that they employ him to prosecute the case. The result of the trial was that the judge perpetuated the injunction, regardless of the opinions ot the board of health, and Dr. W. J. Savage, an eminent physician here. This rather discouraged the people that were interested in this work. This effect has almost destroyed our power, apparently. We think we will rally again.

The board has held nine meetings and expended $40.

A complete record of deaths is kept, and all the births that are reported.

BOWLING GREEN, WOOD COUNTY.

A. Ordway, health officer.

Population (estimated), 6,000.

The streets and alleys are in fair condition. The lack of sewerage is our worst nuisance. The night-soil is removed in barrels to dump ground. Contagious diseases are all reported with the exception of chicken-pox.

The board has been able to restrict contagious diseases. Measles and chicken-pox were more prevalent than usual. Cannot tell as to vaccination. Board meets once in two weeks. No prosecutions.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 4 cases; scarlet fever, 17 cases; typhoid fever, 14 cases; whooping cough, 9 cases; measles, 13 cases.

BRADFORD, DARKE AND MIAMI COUNTIES.

John Tinkler, health officer.

Population (estimated), 1,650.

No report.

Infectious diseases reported during the year: Measles, 2 cases.

BRADNER, WOOD COUNTY.

F. Kirk, health officer.

Population (estimated), 1,200.

Our streets, alleys and yards are in as clean and healthy a condition as could be expected at the present time. There is no complaint or cause for complaint. All nuisances have been successfully abated, except saloons and gambling dens, which I believe come under the law as nuisances and should be subject to the same treatment as any other nuisance. Contagious diseases have not been as fully reported as they should have been; hence, our failure to make a satisfactory report. There has been no contagious disease unusually prevalent, and all cases have been carefully taken in charge by the board. I do not believe that there have been any vaccinations during the past year; have no knowledge of any. Am informed by the superintendent that in conversation with the school board, they say there has been no vaccinations for several years. Probably the majority of the pupils have not been so treated. I should not think, however, that a wholesale process of vaccination would be advisable, at least compulsory treatment would be offensive to most people.

The board has held six regular meetings during the year 1898. Cannot give the exact amount spent during the year, but think that $125 will cover the year's expenses, salaries and all.

There have been no prosecutions within the year. I think there should be more care taken by boards of health in being prompt in attendance on meetings, and careful that the business be done in business-like manner, and they should be more liberal in the salaries paid their special officers Our board pays this year for performing the duties of health officer and clerk the large sum of $25 each, reduced from $50 each last year, and a man cannot do the work as it should be done for the amount paid, and the way the books have been kept proves it.

BRIDGEPORT, BELMONT COUNTY.

Dr. J. Andrew Heinlein, health officer.

Population (estimated), 4,000.

No report.

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 17 cases; typhoid fever, 82 cases; whooping cough, 35 cases; measles, 15 cases.

BROOKLYN, CUYAHOGA COUNTY.

R. E. Stickney, health officer.

Population (estimated), 4,585.

Board is well organized and are preventing the spread of contagious diseases.

Sewerage is very poor. We have a system but it is no good.

Contagious diseases are properly reported. Board met 23 times this year.

Infectious diseases reported during the year: Diphtheria, 4 cases; scarlet fever, 1 case; typhoid fever, 9 cases; whooping cough, 4 cases; measles, 92 cases.

BRYAN, WILLIAMS COUNTY.

N. Vineyard, health officer.

Population (estimated), 4,000.

Sanitary condition is good. Board maintains its organization, and subject to call under all circumstances pertaining to health, etc.

Streets, alleys and yards are kept in a neat, clean condition. The town is thoroughly tiled with 12-inch tile on both sides of streets and through a number of alleys.

Some 500 to 600 barrels of night-soil are annually removed to quarantine grounds and farms near town. All nuisances are promptly abated by order of heath officer.

Every class and character of contagious disease is promptly reported by our village physicians; houses quarantined and visited by the health officer daily; if dangerous twice daily, and never allowed to spread from the house. Diphtheria, scarlet fever and measles only prevail to a limited extent.

Very few children vaccinated; no necessity as yet for it. Board of health meets only when called for. Health officer gets $120 per annum; some $10 expended for antitoxin in one diphtheria family of six cases. No prosecutions for any violations. The health officer nips all violations in the "bud."

Infectious diseases reported during the year: Diphtheria, 12 cases; scarlet fever, 8 cases; typhoid fever, 1 case; measles, 6 cases.

BUCYRUS, CRAWFORD COUNTY.

Dr. W. A. Daugherty, health officer.

Population (estimated), 8,000.

Streets and alleys kept in good condition. No complaint as to the sewerage system. Cleaning of closets in summer is done at night by parties under bond to the city and is satisfactory.

All contagious diseases are properly reported and record kept of same, and board has had no trouble in enforcing the rules.

No account of vaccination, and it is thought about one-half of the children are or have been vaccinated.

The board has met regularly on first Wednesday of each month with a quorum present. Board has spent for salaries and supplies about $425.

No prosecutions during the year.

The principal thing necessary for a better sanitary condition of the city would be an intercepting sewer.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 1 case; scarlet fever, 4 cases; typhoid fever, 50 cases; measles, 15 cases.

BURTON, GEAUGA COUNTY.

Dr. B. F. Ray, health officer.

Population (estimated), 800.

I am pained to inform you that the board of health has failed to meet, or qualify, or elect a health officer for three years or more. I hold the position of health officer for the township of Burton.

You remember I called attention to Burton village two years ago.

CALDWELL, NOBLE COUNTY.

Dr. O. O. McKee, health officer.

Population (estimated), 1,400.

On account of the great expense our town has been to in establishing water works our town council refused to levy any sanitary fund; therefore, greatly handicapped the board of health. The sanitary condition of our town has been good for five years past; consequently it did not get in a bad condition. I raised a war against council and succeeded in giving the town one thorough cleaning, including all drains and alleys. I have gotten our people to hire a scavenger to clean their privies every thirty days. So we keep clean that way—deposit the contents on a farm one mile out of town.

Our board of health meets monthly.

Contagious diseases are not reported as they ought to be, due to not making proper diagnosis.

Infectious diseases reported during the year: Scarlet fever, 6 cases.

CALEDONIA, MARION COUNTY.

Noah Lee, health officer.

Population (estimated), 800.

Our streets and alleys have been kept in good sanitary condition.

Our physicians have been prompt in reporting to me any contagious diseases and I have carded the house immediately thereafter. Diphtheria has been the most prevalent; however, we have been fortunate in not having much sickness especially those that are contagious. The privies have been of most concern to us We have given notices in writing, time limited, to clean, and always followed up closely and cleaned at the expense of the property. I have made it a rule to bury all dead fowls and cats, etc., on sight or by notice. We think the result of our work has manifested itself in having less sickness. We have been at no extra expense save the health officer's salary and clerk's fees. Could not send a representative to the board meetings held by the State, having no funds and council objecting to the expense.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 1 case.

CAMBRIDGE, GUERNSEY COUNTY.

I. A. Oldham, health officer.

Population (estimated), 9,000.

The sanitary condition of our city is fairly good. The city has lacked sewerage until the latter part of the year when about ten thousand feet of sanitary sewer was completed and opened for use.

The board has been successful in abating nuisances, and has had no trouble in having their orders obeyed.

Night-soil is removed in air-tight vessels to a farm near the city and the same is cared for by plowing under.

Garbage that putrefies is taken to same place and is disposed of in like manner Garbage that is not effensive is removed by scavengers to the city dump.

Contagious diseases are reported promptly and the board has no trouble in enforcing restrictive measures. A record is kept of all contagious diseases reported to the board.

There has been no vaccination in the city during the year.

Of the fifteen hundred and twenty-three pupils attending school, less than 15 per cent. have been vaccinated.

For the year the board has held eight meetings, and have maintained an active organization.

The expense incurred was $511.00.

Would suggest a less number of members and they receive a compensation.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 1 case; scarlet fever, 22 cases; typhoid fever, 10 cases; whooping cough, 2 cases; measles, 4 cases; other infectious diseases, 2 cases.

CANAL DOVER, TUSCARAWAS COUNTY.

H. Breitenstine, health officer.

Population (estimated), 4,000.

Sanitary condition good. Have maintained active organization and enforced proper measures to prevent contagious diseases and abatement of nuisances.

Streets and alleys clean. Have no sewerage.

Have no way to report on vaccination. Have had two meetings, but have made arrangements to hold monthly meetings this year. Expenses of the board $50.

Infectious diseases reported during the year: Diphtheria, 2 cases; scarlet fever, 7 cases; typhoid fever, 1 case; measles, 3 cases.

CANAL FULTON, STARK COUNTY.

Joseph Ford, health officer.

Population (estimated), 1,450.

Our streets, alleys and yards are in a fair condition. Manure piles in some alleys which will be cleaned up as soon as the frost is out of the ground. Otherwise there is no cause for complaint.

There are no nuisances that have not been abated. The sewerage here is surface drainage, and these are kept as clean as possible.

All contagious diseases have been properly reported and restrictive measures, as far as possible, have been enforced. There have been one hundred and twenty-three children vaccinated attending public schools and two hundred and eight who have not been. Those who have not been are usually small children. The board has had only four formal meetings during the year, but have been together at other times looking after places requiring attention in the village.

Infectious diseases reported during the year: Diphtheria, 11 cases.

CANAL WINCHESTER, FRANKLIN COUNTY.

Dr. W. S. Gayman, health officer.

Population (estimated), 800.

Streets, alleys and yards are in a cleanly condition. No sewerage. No nuisances but what are easily abated. No removal or disposition of night-soil and garbage. Number of persons vaccinated during 1898, six.

Total enrollment in grades below high-school, 147; number vaccinated, 49; unvaccinated, 98.

Health board meets every third Monday night of each month. Total amount spent by board during 1898, $75.

CANFIELD, MAHONING COUNTY.

A. D. Wood, health officer.

Population (estimated), 700.

Streets, etc., in good condition. Sewerage mostly natural. Complaint has been made of night soil deposited in vacant lot; no action taken by board other than order it cleaned. Owners or occupants renovate and clean privies.

Contagious diseases are properly reported, but a perfect record is not kept. Measles were unusually prevalent during the year. I am unable to ascertain how many people were vaccinated during the year, or how many school children are unvaccinated.

The board held three meetings. No money was spent.

Infectious diseases reported during the year: Scarlet fever, 2 cases; measles, 3 cases.

CANTON, STARK COUNTY.

J. F. Marchand, M D., health officer.

Population (estimated), 40,000.

Our streets and alleys during the past year have been kept in a fairly cleanly condition. The work has been done by our street commissioner, and done as well as his means would allow. However, our paved streets should be cleaned regularly each week by flushing or sweeping, and we hope soon to have some plan of systematic cleaning. The block system in the central portion of the city seems to be the best way of street cleaning. It is to be regretted that our entire city is not provided with sewerage. Sections of the city not so provided are greatly in need of sewerage, and I believe that the sanitary condition of the city would be benefited more if we had a complete system of sewerage for all sections, than any other public improvement that we could have. Next to this most important improvement comes the value of a garbage furnace. If we had a garbage furnace that would solve the question of the proper disposal of sewage not accommodated by our sewerage. We need a furnace very badly, and I believe that very soon we will have one. It is a necessity, and once established and built we could not do without it. Our night-soil and garbage are hauled out into the country and deposited in fields for fertilizing purposes. This is dangerous and objectionable.

All contagious diseases are reported by our physicians, and the board of health keeps a record of each case, and promptly quarantines the houses. Our board of education acts promptly and assists us in every way against the spread of contagious diseases in the public schools. The same can be said of those in charge of the parochial schools. In this part of our work we have the hearty coöperation of all school authorities. It is my opinion that a large number of pupils in the schools have not been vaccinated. The board of health during the past year by resolution, through the daily press, strongly urged the necessity of vaccination and revaccination of all school children. This was as much as the board did for vaccination. We have had no smallpox in our city or near us (except in Cleveland) during the past year.

During the past year the board has held nine meetings. The expenses of the board during the year have been $3,145.

There was one prosecution by the board during the year. A physician was prosecuted for not reporting a case of contagious disease to the board within the specified time enacted by the board of health in its rules and regulations. After a hearing of the case, the mayor reserved his opinion. Recently he informed the board that he declared the rule unconstitutional, and here the case ended.

phtheria has been more prevalent than usual during the past year. Our physicians, by the use of antitoxin, have greatly reduced the mortality. We fumigate all houses with formaldehyde gas where there has been contagious disease, and believe it does good.

Infectious diseases reported during the year: Diphtheria, 156 cases; membranous croup, 3 cases; scarlet fever, 47 cases.

CAREY, WYANDOT COUNTY.

I. N. Zeis, M. D., health officer.

Population (estimated), 2,000.

In reply to your questions will say our streets, alleys, etc., are clean; and people take pride in keeping their streets clean. In regard to sewerage, we have none, only a small stream that flows through our town, but we endeavor to keep that clean as possible. In fact, sewerage is all that we lack to make our town equal to any. We have had no trouble to enforce our orders. Contagious diseases have been properly reported. In fact, since I have been health officer, we have had only a few cases, and they were all properly reported. In regard to vaccination I cannot say how many have been vaccinated. We have not enforced vaccination as yet, but will if it becomes necessary. We have held six meetings during the year, and have expended $133. We have had no prosecutions.

CARROLLTON, CARROLL COUNTY.

Dr. A. H. Hise, health officer.

Population (estimated), 1,500.

Board is all O. K., but needs some one to have them understand that it is necessary to hold meetings as often as required by law. With this exception the board is doing very well. The council will not allow delegates expenses to the annual meeting; hence, none appointed.

Infectious diseases reported during the year: Scarlet fever, 7 cases.

CARTHAGE, HAMILTON COUNTY.

Harry Ross, health officer.

Population (estimated), 2,500.

We have an excellent garbage system, which keeps the village in a splendid sanitary condition at all times. We need a sewerage system very much. But on account of the taxation are unable to obtain it. The night-soil is removed at night and taken to the country and buried. So far we have had no trouble to abate any nuisance. We have the support of council to a man. We are very strict in having physicians report all contagious diseases, and give same our attention until cured and all danger is over. Every member of the public schools of this village has been vaccinated *by order of the board.* There has been no infectious diseases in the village in the past year except a few cases of whooping cough and measles last spring. We have had no prosecutions. We have had but two meetings during the year. Total amount expended by the board during the year was $150.

Infectious diseases reported during the year: Whooping cough, 19 cases; measles, 53 cases.

CASSTOWN, MIAMI COUNTY.

No health officer.

Population (estimated), 300.

There is no board of health.

There is no attention given to vaults and night-soil. In this respect people do as they please. Microbes run riot.

Sewerage is fair; streets are cleaned.

Typhoid fever has been very common until this last year. Only one case last year.

No pupils or persons vaccinated last year or within eight years.

There has been no cases recorded or reported. The only work done is by council and street commissioner, and that is limited to cleaning gutters and sewers.

Wells are shallow and in danger of being infected from vaults.

Physicians with small incomes are not going to prosecute their patrons for violating health laws of the State.

Better appoint persons for health officers and board of health who are not dependent upon public for support.

I am not health officer; there is none.

Yours truly,
I. H. Borough, M. D.

CEDARVILLE, GREENE COUNTY.

D. H. McFarland, health officer.

Population (estimated), 1,500.

The sanitary condition good. The board active. It has been successful in enforcing laws for the prevention of contagious diseases and the abatement of nuisances.

Streets and alleys and premises in fair condition. Sewerage good.

Night-soil hauled to dump at night in tight barrels.

No contagious diseases reported in three months. The board meets the second Tuesday of each month.

The expenses for the year were $98.5

Number of pupils in public schools, 298; number not vaccinated, 148.

Infectious diseases reported during the year: Diphtheria, 1 case; membranous croup, 1 case; whooping cough, 1 case.

CELINA, MERCER COUNTY.

Dr. L. P. Lisle, health officer.

Population (estimated), 2,800.

Streets, alleys and yards are kept in fair condition. Complaints are frequent on account of a lack of proper sewerage.

We have endeavored to abate nuisances, some of which we have failed to do, one in particular, that is draining water closets into private sewers without any outlet.

Night-soil and garbage are hauled outside corporation and buried. Physicians pay but little attention to reporting contagious diseases. A record of contagious diseases is kept as complete as possible under the circumstances. The board is fairly protected in its duties. There has been no unusual prevalence of any contagious disease. There have been about 550 vaccinations during the year. There are not more than seventy-five children attending school who have not been vaccinatd. Meetings have been held monthly. Our board spent $640 during the year. There have been no prosecutions during the year.

Infectious diseases reported during the year: Diphtheria, 3 cases; membranous croup, 2 cases; smallpox, 1 case; whooping cough, 2 cases; measles, 7 cases; other infectious diseases, 4 cases.

CENTERBURG, KNOX COUNTY.

I. C. Coe, health officer.

Population (estimated), 700.

Sanitary condition is good. The board has maintained a good organization and has been successful in all its work.

Infectious diseases reported during the year: Typhoid fever, 3 cases.

CHAGRIN FALLS, CUYAHOGA COUNTY.

I. N. Warner, health officer.

Population (estimated), 2,000.

The sanitary condition is as good as could be without sewerage.

The board of health has not maintained an active organization. They do not meet regularly. I have been obliged to go it alone as best I could. I have counseled with the mayor, who has at all times rendered me any assistance in his power. I have had no trouble from non-compliance with my wishes in sanitary matters. I have been compelled to issue but four orders for non-compliance. My orders in these cases have been promptly complied with.

There is cause for complaint from lack of sewerage. We have been successful in abating nuisances. There are parties here who will remove night-soil on application.

There is no arrangements for removing garbage. Every one removes from his or her premises. ·

Contagious diseases are properly reported. I keep a record of them.

There has been no prevalence of contagious diseases. There have been none vaccinated.

Since I was appointed health officer there has not been a quorum but once of the health board. The mayor told me a few days since that he would have a new board next year.

Since I was appointed health officer on July 11, 1898, $23.05 has been expended.

I have no suggestions to make.

We give no permits for removing night-soil and garbage. Would it be practical to give one responsible person a permit to remove both, and collect from the parties a reasonable fee for his services, and have him do all of said work, where the people did not wish to do their own work?

I do not know how many children there are who are not vaccinated. The board to-day decided not to vaccinate at present.

Infectious diseases reported during the year: Typhoid fever, 1 case.

CHATFIELD, CRAWFORD COUNTY.

J. H. Mollenkop, health officer.

Population (estimated), 300.

Our board is of no use as there has been no meeting held during 1898. I have been acting as best I could to cope with contagious diseases, but have had no board to help me out, so I have come to the conclusion there is no need to have a health officer without a health board. What I would like is to have you in some way see that our council has the board appointed to do business in a right way. If you can use any measure to do that it is needed. Our alleys are in proper shape, our night-soil is buried in the rear end of each property owner's lot.

There has been no vaccination for about 12 years, so all children since born or up to the age of 12 to 14 years are not vaccinated.

I have placarded the houses as soon as contagious diseases were reported to me, and I have acted out and filled my part with much trouble in some cases. I hope you may bring about some arrangements that we may have a board to held their monthly meetings and take care of all things pertaining thereto for the welfare of the public.

Infectious diseases reported during the the year: Scarlet fever, 3 cases; whooping cough, 3 cases; chicken-pox, 2 cases.

CHICAGO, HURON COUNTY.

Dr. D. H. Young, health officer.

Population (estimated), 2,500.

Amount expended for the health board $125, which includes pay for health officer.

Sewerage none. only open sewers. Some private ones. Streets and alleys fairly clean.

There are a great many complaints from lack of sewerage.

All contagious diseases are promptly reported. Have had no trouble to control all cases. Could not obtain the number of children unvaccinated. There has been no formal meeting of the board in a year.

The tile pond complained of is in the same condition as when seen by the Secretary, Dr. Probst, and is the only thing that there has been much complaint of.

Water works have been completed and partially in service. Everything completed in good order.

Infectious diseases reported during the year: Scarlet fever, 4 cases; typhoid fever, 3 cases.

CHILLICOTHE, ROSS COUNTY.

J. M. Hanley, M. D., health officer.

Population (estimated), 16,000.

Streets and alleys are in fairly good condition, the cleaning of streets and alleys is under the jurisdiction of city street commissioners.

The central part of the city has sanitary and storm sewerage, an extension will in all probability be made the coming summer.

Excrement, night-soil, sink and privy cleanings are removed in air-tight vessels between 10 P. M. and 5 A. M. by persons who have a license from the board of health. The city is divided into four districts and garbage is collected daily during the summer months, and often as possible during the winter months.

Contagious diseases are properly reported and a record of such diseases kept, and restrictive measures enforced. Diphtheria has been more prevalent than usual. The number of unvaccinated children attending public and parochial schools is 1,200.

Sixteen meetings held during the year 1898. Total amount spent by board of health for the year 1898 was $3,466.75.

Three prosecutions, two cases of removing filthy and offensive substances in daytime and also without proper licenee. One case for entering and departing from house under *quarantine* (scarlet fever). The three received a small fine and suspended sentence, being their first offense, these prosecutions made under the present officers of health board.

Infectious diseases reported during the year: Diphtheria, 34 cases; membranous croup, 5 cases; scarlet fever, 8; measles, 10 cases; other infectious diseases, 5 cases.

CINCINNATI, HAMILTON COUNTY.

Dr. W. A. R. Tenney, health officer.

Population (estimated), 405,000.

No report.

Infectious diseases reported during the year: Diphtheria, 392 cases; membranous croup, 53 cases; scarlet fever, 286 cases; typhoid fever, 443 cases; smallpox, 16 cases; whooping cough, 459 cases; measles, 756 cases; phthisis, 528 cases; varicella, 200 cases.

CIRCLEVILLE, PICKAWAY COUNTY.

J. L Cummins, health officer.

Population (estimated), 7,000.

The streets, yards and alleys in the city are in good condition for this time of the year.

There is reason for complaint from lack of sewerage, but not from improper discharge of the same. There have been no nuisances which the board has failed to remove. Night-soil is removed after 10 P. M and buried outside the city limits.

Contagious diseases are reported, except typhoid fever. A record of the same is kept. Measles have been more prevalent than usual. No vaccination during the year. School children unvaccinated, 1,050.

Board of health held ten meetings during the year. Total amount spent during the year, $125.

Infectious diseases reported during the year: Measles, 211 cases.

CLEARPORT AND MADISON TOWNSHIP, FAIRFIELD COUNTY.

Dr. James T. Hufford, health officer.

The sanitary condition of township and village good. Our township trustees are organized into a board of health, and during the past year we have been very fortunate. There has been no diphtheria, scarlet fever, smallpox or mumps, in fact, an entire absence of these diseases. Just now we are threatened with measles from over in Hocking county. There have been cases occurring over the line in Hocking for two months, but not till the schools opened did they spread so rapidly, and protracted meetings through the country finished the job. We had about six cases of typhoid fever in the township during the year, two were fatal. There was one case of membranous croup, but I could find no signs of diphtheria. This case occurred in a family of several children, with no other case. I have done very little vaccinating. I keep a small supply of virus in tubes, so as to be ready for an emergency.

The past year there have been no nuisances reported, with the exception of one or two schools having lice, I think from tramps occupying them (the school houses) at night. The school board had the windows protected with wire netting and good locks on the doors and there has been no further trouble.

Our board has a meeting when there is some business to look after and there has been none at any other time, only to meet to organize.

Infectious diseases reported during the year: Membranous croup, 1 case.

CLEVELAND, CUYAHOGA COUNTY.

Dr. J. L. Hess, health officer.

Population (estimated), 375,000.

The health department abated during the year 63,867 nuisances of almost every conceivable nature.

Physicians have not, as a rule, failed to report contagious diseases.

The health department brought prosecutions in six cases and were successful in all. In one case fine was imposed because of house plumbing. One case still pending in police court because of smoke nuisance. Estimated number of persons vaccinated during the year was 30,000. Total amount of money spent by the health department was $41,851.29.

Infectious diseases reported during the year: Diphtheria, 483 cases; membranous croup, 74 cases; scarlet fever, 557 cases; typhoid fever, 280 cases; smallpox, 70 cases; whooping cough, 277 cases; measles, 2,721 cases; other infectious diseases, 82 cases.

COLLINWOOD, CUYAHOGA COUNTY.

P. E. Kerlin, M. D., health officer.

Population (estimated), 3,300.

Streets and alleys, etc., are in as good condition as possible under present conditions. There is lack of sewerage, and board is unable to abate nuisances. Poultry yard facing on Main street, where are kept ducks, chickens, geese, turkeys, etc. Board has not taken any definite action as yet. Night-soil and garbage are removed under special contract to adjoining farms and used as manure.

Contagious diseases are properly reported, but no record is kept. Board has been able to enforce such restrictive measures as is necessary. Scarlet fever has been most prevalent disease. About 50 persons have been vaccinated. Number school children vaccinated 244, not vaccinated 197, not obtainable 51.

Board of health held ten regular and eight special meetings, and expended $1,371.63.

Infectious diseases reported during he year: Diphtheria, 1 case; scarlet fever, 9 cases; typhoid fever, 3 cases; other infectious diseases, 3 cases.

COLUMBIANA, COLUMBIANA COUNTY.

Geo. Roninger, health officer.

Population (estimated), 1,800.

The village is in good condition in regard to streets, alleys and yards. No complaint of sewerage. Water closets are, as a rule, cleaned thoroughly twice a year, very many of them oftener, by the "night-soiler", who hauls the night-soil away.

Contagious diseases are properly reported, and a record kept. Occupants of houses where contagious diseases exist are quarantined, placards put on the door, and no one allowed to enter or leave the house. House is disinfected, and placards not removed until the health board is notified by the attending physician. No vaccinations during the year.

The board of health averaged about four or five meetings during last year. I suppose it ought to meet oftener, has not maintained active organization, as in large cities, because village is in good condition, water and wells in good condition, and town water is a great help to those whose *wells* were not satisfactory.

Amount of money spent for the year was about $50.

Report of deaths is not accurate as the board of health does not receive a report every month.

COLUMBUS, FRANKLIN COUNTY.

Dr. J. B. Schueller, health officer.

Population (estimated), 140,000.

Streets generally are kept in a cleanly condition, alleys and yards less. The garbage of the households and hotels is removed, under contract, by the Columbus Sanitary Works Company; night-soil by vault cleaners, who dump it outside the city, wherever they please.

Of all contagious diseases diphtheria, scarlet fever and measles are properly reported, of whooping cough and typhoid fever but about 50 per cent. Records are kept. Restrictive measures are quite satisfactory. Measles have been very much more prevalent than usual.

The law of 1893 abolished the board of health of Columbus, therefore there are no board meetings.

The amount of disbursements of our health department, exclusive of the $15,800 for garbage collection, has been $10,865.91, including $10,196 salaries, $226.50 smallpox quarantine, $443.41 for printing, postage, disinfectants, etc., to be paid out of a total receipts of $4,340 65 (balance for 1897 $1,143.73, and tax collection for 1898 for sanitary purposes proper, after deducting $15,800 for garbage collection, of $3,296 92), causing a deficiency at the close of the year 1898 of over $6,500. All expenditures, with the exception of incidentals, were ordered by the city council.

Infectious diseases reported during the year: Diphtheria, 116 cases; scarlet fever, 102 cases; typhoid fever, 98 cases; smallpox, 1 case; whooping cough, 133 cases; measles, 2,450 cases.

COMMERCIAL POINT, PICKAWAY COUNTY.

W. J. Rout, health officer.

Population (estimated), 300.

I received orders from our local board to enforce all sanitary measures conducive to the health of the people of the corporation and vicinity, and am enforcing them to the letter, and the result is more than satisfactory, as you can see from my report. There is not a case of sickness within the corporation at present, nor has there been for the past two months.

Our school has an enrollment of 118, and of that number about 85 have never been vaccinated, and I have no power farther than to notify them, unless the State board can enforce it, or give me the right to do it.

I hope we may be as successful in warding off disease in 1899 as we were in 1898.

Infectious diseases reported during the year: Typhoid fever, 2 cases.

CONNEAUT, ASHTABULA COUNTY.

D. S. Cossitt, M D., health officer.

Population (estimated), 5,000.

Streets, alleys and yards are well cared for, especially so during year of 1898, as a house to house inspection was made and all nuisances abated.

Western and northern portions of village not in sewer district are badly in need of sewer system. Cesspools are used to get rid of waste water and are a constant menace to health, as the majority of sinks connected are not trapped or vented.

Board of health has ordered all house connections put in sanitary condition.

All orders of the board have been complied with.

Night-soil is collected in air tight containers and buried in accordance with the rules and regulations.

Contagious diseases are promptly reported and record kept, with the exception of whooping cough, which is prevalent at the present time, and few cases reported.

Have no means of ascertaining number of persons vaccinated during the year or of unvaccinated children attending school.

Number of meetings—regular, 6; special, 5.

Amount of money expended, $507.74.

There were no prosecutions.

Infectious diseases reported during the year: Diphtheria, 6 cases; scarlet fever, 2 cases; typhoid fever, 19 cases; measles, 215 cases.

CORNING, PERRY COUNTY.

William Anderson, health officer.

Population (estimated), 1,800.

No report.

Infectious diseases reported during the year: Typhoid fever, 9 cases; measles, 40 cases.

COSHOCTON, COSHOCTON COUNTY.

J. E. Foster, V. S., health officer.

Population (estimated), 5,000.

Our streets are in a cleanly condition, but most of the alleys and some yards are a continual source of annoyance to the board of health. There is no cause for complaint from lack of sewerage or from an improper discharge of sewage.

The board of health has successfully abated all nuisances which it ordered abated. Night-soil is removed in a water-tight tank. Some is deposited in the river near the sewer outlet, and some is hauled to the country and then plowed under ground.

Garbage is removed by parties residing in the country, engaged in swine raising. Contagious diseases are properly reported, and a record of same is kept. Restrictive measures are properly enforced.

Scarlet fever, measles and typhoid fever have been more prevalent than usual. Nine persons were vaccinated during the year. Seventy-four per cent. of the school children are unvaccinated. Six meetings were held during the year; $14.80 was spent for necessary blanks, cards and disinfectants.

No prosecutions were brought by the board. Usually when the order of the board is disregarded we proceed according to sections 2129 and 2130, laws of Ohio relating to boards of health.

I have no suggestions to offer regarding boards of health excepting as to the individual members, who should be men who naturally delight in doing sanitary work, and should have considerable knowledge of sanitary measures and realize the responsibility connected with the position. I fear that many are criminally indifferent, or possess reprehensible ignorance and stupidity. They should know that modern medicine tends toward prevention of disease through a better understanding of the means of transmission and perpetuation. Many do not seem to recognize the fact that they are in the midst of a great public which needs enlightenment on the principles of sanitation, and particularly as to animal diseases and the important relation of some of these diseases to our food supply.

The proper authorities should bear in mind that our citizens are entitled to meat that is as pure, nutritious and wholesome as that obtained from us by foreigners; that it is the duty of those in authority to secure for the local consumer the same guaranty that our national government provides for the foreign consumer. Members of boards of health should not assent by silence to the sale of food products contrary to revealed knowledge. They should realize that private and country slaughter-houses should be abandoned as relics of an age when modern sanitation was unknown also that as the result of ignorance o carelessness on the part of some dairymen, premature graves have likely been dug for children. It is the duty of members of boards of health to do their utmost to protect these innocent and helpless ones, who are incapable of doing anything themselves against their deadly enemies.

Infectious diseases reported during the year: Diphtheria, 5 cases: scarlet fever, 58 cases; typhoid fever, 29 cases; measles, 547 cases; other infectious diseases, 8 cases.

COVINGTON, MIAMI COUNTY.

George Flammer, health officer.

Population (estimated), 2,000.

Streets, alleys and yards are kept exceptionally clean. Have no sewer system. All nuisances have been abated when so ordered. Night-soil is hauled to farms and plowed under.

Contagious diseases are promptly reported. A record of same has been kept since October, 1898. The order of the board has been obeyed. The most prevalent contagious disease has been scarlet fever. Number of persons vaccinated during the year, 169. Superintendent of schools reports number of children unvaccinated, 48, but some must comply with order of board of education within one *week from this date, January* 7, 1899.

The Board of Health: There were four meetings held during the year. Expenditures for the year $56.60. No prosecutions. No suggestions to offer.

Infectious diseases reported during the year: Scarlet fever, 3 cases; typhoid fever, 2 cases.

CRIDERSVILLE, AUGLAIZE COUNTY

Benj. Bloyer, health officer.

Population (estimated), 650.

Sanitary condition good.

Board of health has an active organization, and has been successful in enforcing proper measures for prevention of contagious diseases.

No cause for complaint from improper sewerage or discharge of same.

Night-soil is hauled on farms and used for manure. Garbage is removed about three miles from town.

Contagious diseases are properly reported and record of same kept. Board of health has enforced proper restrictive measures to prevent spread of contagious diseases.

Smallpox most prevalent contagious disease.

About twenty-five persons vaccinated.

Eleven meetings held during 1898 and $25 expended by board of health.

No prosecutions for violations of health laws.

Infectious disease reported during the year: Smallpox, 1 case.

CROOKSVILLE, PERRY COUNTY.

E. U. Tatman, health officer.

Population (estimated), 1,000.

No report.

Infectious diseases reported during the year: Scarlet fever, 15 cases; typhoid fever, 8 cases.

CYGNET, WOOD COUNTY.

D. J. Baker, health officer.

Population (estimated), 1,200.

Streets and alleys are in good condition, better than ever before.

The board finds no cause for complaint from sewerage.

Nothing of any importance that the board has been unsuccessful in abating.

Night-soil and garbage removed one mile and buried on leased ground.

No contagious diseases were reported to the board. Physicians report none existed. No record kept of vaccination and very little practiced, and little if any among children.

About eleven meetings of board during the year.

The expense of board for the year did not exceed $60.

No prosecutions were necessary.

Think the present law is good enough if properly enforced.

DALTON, WAYNE COUNTY.

A. H. Arick, health officer.

Population (estimated), 750.

The conditions of this village is in a good state, and as for contagious diseases we slipped clear this year.

The streets and alleys are in good shape, There have been no nuisances ordered abated that were not attended to.

As for vaccination there were few if any.

The board had but three meetings. Amount spent $10.

Infectious diseases reported during the year: Diphtheria, 3 cases; typhoid fever, 6 cases.

DARBYVILLE, PICKAWAY COUNTY.

M. N. Bowman, health officer.

Population (estimated), 400.

Streets, alleys and yards are not in a cleanly condition. There is cause for complaint from improper discharge of sewage. No arrangements are made for the removal and disposition of night-soil and garbage.

Contagious diseases are properly reported. There is a record of such diseases kept. The board has not been able to enforce proper restrictive measures. The contagious disease most prevalent was measles. Number of persons vaccinated during the year, none.

The board of health held during the year four meetings. We organized August 5, 1898, and held four meetings. We have a full board, but the council of the village refuses to pay health officer and clerk for their services, and the expenses of the board of health, so we have not had a meeting for two or three months, so this is the condition of our board of health.

Infectious diseases reported during the year: Diphtheria, 1 case; membranous croup, 1 case; scarlet fever, 1 case; whooping cough, 3 cases; measles, 12 cases; other infectious diseases, 4 cases.

DAYTON, MONTGOMERY COUNTY.

Dr. C. A. Bonner, health officer.

Population (estimated), 85,000.

We have no board of health, only a health officer and clerk.

Sanitary condition was fairly good on July 1, 1898, since which time we have had no sanitary officers, except during one case of smallpox, which was carefully quarantined. Garbage is removed by contract and not satisfactorily done. Night-soil partly burned at crematory, some hauled to country.

Contagious diseases not fully reported, and not all quarantined. Have not been able to enforce restrictive measures. Record is kept of cases reported.

There have been eighteen regular and called meetings of the board of health during the year. Expended from regular sanitary fund, $3,154 34; special sanitary (smallpox, flood, etc.), $2,333.03; total, $5,487.37.

Infectious diseases reported during the year: Diphtheria, 39 cases; membranous croup, 9 cases; scarlet fever, 30 cases; typhoid fever, 23 cases; smallpox, 1 case; whooping cough, 6 cases; measles, 1,043 cases.

DEFIANCE, DEFIANCE COUNTY.

L. K. Miller, health officer.

Population (estimated), 9,500.

The streets and alleys are all kept in a good sanitary condition. There is no cause for complaint for the lack of sewerage. All nuisances the board ordered abated were abated. All night-soil is hauled away between the hours of 10 P. M. and 5 A. M. in air-tight barrels, beyond the city limits.

All contagious diseases are properly reported. These is also a record of such contagious diseases kept. Scarlet fever has been more prevalent than any other contagious diseases. About 126 children have been vaccinated during the year. About 1,000 school children that are not vaccinated.

The board has held sixteen meetings during the year. There was $480 spent during the year.

Infectious diseases reported during the year: Scarlet fever, 11 cases; typhoid fever, 5 cases; measles, 12 cases.

DE GRAFF, LOGAN COUNTY.

J. W. Hendershott, health officer.

Population (estimated), 1,300.

The reason I have not given you a monthly report is that our town has been unusually lucky. The smallpox has been in our county, but not nearer to us than eight miles. Every case of scarlet fever has been closely watched and quarantined, not even one case of fever could be traced to where they had been exposed. Our Union school was closed but two weeks. There is no more fashionable disease here now than the la grippe, for our town is full of it. Our health board claim the cleanest town in Ohio. We take pride in keeping our streets and alleys clean. All sanitary precautions taken.

Infectious diseases reported during the year: Scarlet fever, 13 cases.

DELAWARE, DELAWARE COUNTY.

D. E. Hughs, health officer.

Population (estimated), 10,000.

Streets and alleys are in a good condition. Have no general system of sewerage, so there is necessarily some trouble in that line. Have had no trouble in abating nuisances. Garbage and night-soil are hauled away by a sanitary contractor employed by the city.

Contagious diseases are very promptly reported, as a rule. Board has enforced restrictive measures in all cases. Diphtheria and scarlet fever have prevailed more than any other contagious disease. Number of persons vaccinated (estimated) 500.

Number of meetings held was twelve. Amount spent, $500. No prosecutions of any kind.

Infectious diseases reported during the year: Diphtheria, 10 cases; membranous croup, 2 cases; scarlet fever, 4 cases; typhoid fever, 40 cases; measles, 2 cases; other infectious diseases, 6 cases.

DELTA, FULTON COUNTY.

William Ramsey, health officer.

Population (estimated), 1,500 to 1,600.

Sanitary condition is good. We maintain an active organization and have been successful in enforcing measures for the prevention of contagious diseases and abolishing or abating nuisances. Streets, alleys and yards are in a cleanly condition. No complaints from lack of sewerage. No trouble in abating nuisances. Night-soil is usually used by farmers in the country, the same with garbage.

Contagious diseases are reported and a record kept. Scarlet fever has been the most prevalent. None vaccinated. Superintendent cannot answer how many vaccinated.

The president calls meetings of the board when I notify him to do so of work to be done. The board of health has spent probably $3 during the year. No prosecutions. No suggestions to make.

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 5 cases; typhoid fever, 18 cases; whooping cough, 3 cases; measles, 1 case; other infectious diseases, 8 cases.

DENNISON, TUSCARAWAS COUNTY.

Dr. L. H. Hughes, health officer.

Population (estimated), 4,500.

No report, except contagious diseases.

Infectious diseases reported during the year: Diphtheria, 24 cases; membranous croup, 6 cases; scarlet fever, 2.

CLYDE, SANDUSKY COUNTY.

F. G. Tuttle, health officer.

The sanitary condition of the village is good.

Infectious diseases reported during the year: Diphtheria, 6 cases; typhoid fever, 5 cases; measles, 49 cases; other infectious diseases, 3 cases.

DOYLESTOWN, WAYNE COUNTY.

Dr. A. E. Stepfield, health officer.

Population (estimated), 1,200.

Streets and alleys good. Sewerage insufficient when we have dashing rains. No special arrangements made to remove night-soil, it is looked after and ordered removed when complaint is made.

All contagious diseases are properly reported and a rigid quarantine kept. A record is kept of contagious diseases. Board has been able to enforce proper restrictive measures. We have had several cases of scarlet fever. We enrolled 300 scholars in the public school, and only thirty-one have been vaccinated. One active case of smallpox would bring about good results in this line.

The board of health has met but once during the year. The board has spent about $40 during the year.

All violators of the laws governing the board of health have been brought to time, and only two arrests during six years, both fined.

I do not know that I could offer any valuable suggestions for the board at present. I think that the State board is doing a good work, and this board, while they do not hold many meetings, it is expected that the health officer will look after everything and when he cannot have the nuisance abated, call the board together and compel things to go right.

Infectious disease reported during the year: Scarlet fever, 1 case.

DUBLIN, FRANKLIN COUNTY.

Dr. L. McKitrick, health officer.

Population (estimated), 400.

Streets and alleys are in good condition. Our village has no sewerage at all. The rock is so close to the surface we never have had sewers. The vaults are never cleaned nor any attention paid to them.

No nuisances.

No arrangements have been made for removal of garbage or night-soil.

Contagious diseases are reported properly. A record has been kept.

The board has kept proper restrictive measures. We had smallpox at Amlin, which was unusual.

Two hundred and fifty children vaccinated. All children of school age were vaccinated.

Four meetings. About $35.

I think when a family has diphtheria, scarlet fever or smallpox, the board of health should furnish a competent nurse and pay all bills of said nurse.

Infectious diseases reported during the year: Smallpox, 7 cases.

DUNKIRK, HARDIN COUNTY.

C. C. McLaughlin, M. D., health officer.

Population (estimated), 1,500.

Streets and alleys are kept in first-class condition, as also is the sewerage. All nuisances reported to board of health were abated upon first notice.

Night-soil and garbage are taken outside corporation limits and buried.

Contagious diseases are properly reported, but no record is kept. Restrictive measures are enforced. Scarlet fever, about thirty-five mild cases. No one vaccinated to my knowledge.

There have been only three or four meetings held in the past year, which were called. No regular meetings.

There have been no prosecutions made by the board.

Infectious diseases reported during the year: Scarlet fever, 35 cases; typhoid fever, 1 case; whooping cough, 15 cases.

EAST CLEVELAND, CUYAHOGA COUNTY.

T. H. Bushnell, health officer.

Population (estimated), 2,200.

The board of health of the village has maintained an active organization. Sanitary conditions are satisfactory, or as nearly so as can be expected in a community rapidly developing from a small village into a more thickly settled state.

The money has been voted to put in a sewer system, which will doubtless be built during the year.

Night-soil goes into vaults or cesspools, and is removed by the proper authorities at night and carried out to a farm and spread on the ground.

Health board holds a regular monthly meeting, but frequently no quorum attends. However, most members of the board and the health officer are in telephonic communication with each other, and when occasion requires can meet on short notice.

No contagious diseases have appeared.

Vaccination has been ordered by the superintendent of schools, I am told, for all pupils who have not hitherto been vaccinated.

The board of health has expended in the neighborhood of $200 during the year. Individuals for removal of night-soil, etc., have probably expended more than that sum.

A number of persons have been ordered to abate what was dangerously near a nuisance, and there has been, in most instances, a cheerful compliance with the orders of the board.

EAST LIVERPOOL, COLUMBIANA COUNTY.

C. B. Ogden, M. D., health officer.

Population (estimated), 16,000.

The city has been in a good sanitary condition all of the past year. The completion of Sewer District No. 2 will mark the beginning of an improvement in the healthfulness of that part of the city. The general extension of our street paving and cleaning of alleys, have added to some extent healthfulness of our city. The garbage question has been before us for a long time. We are now pleased to report that the matter has been taken up by the board, and a special committee is now investigating the different methods of disposing of garbage and refuse. In our next report we hope to be able to report that this problem has been solved to the satisfaction of all concerned. The sanitary policeman has made his regular tours of inspection, and has served 746 notices to abate nuisances, etc. There have been no prosecutions. We have been very fortunate in having all contagious diseases reported (of which a record is kept) and the enforcement of proper restrictive measures. The board spent about $920.

Infectious diseases reported during the year: Diphtheria, 5 cases; scarlet fever, 3 cases; typhoid fever, 54 cases; whooping cough, 3 cases.

EAST PALESTINE, COLUMBIANA COUNTY.

Wm. H. Olloman, health officer.

Population (estimated), 2,500.

Our board has not been very active. We have only four members at present. It is a difficult thing to get men to serve with any degree of interest. Streets and alleys in fair condition.

Complaints are frequently made regarding waste water owing to lack of proper sewerage.

Nuisances are invariably abated when notified. No arrangements for removal of night-soil and garbage.

Contagious diseases are reported and record kept.

There are 603 pupils enrolled in our schools; 360 are unvaccinated.

We held one meeting of the board last year. Total amount spent by the board, $44.50. No prosecutions for violation of health laws.

Infectious diseases reported during the year: Diphtheria, 1 case; scarlet fever, 4 cases; typhoid fever, 6 cases; whooping cough, 2 cases; measles, 34 cases.

EATON, PREBLE COUNTY.

F. Campbell, health officer.

Our physicians from some cause or causes do not assist me and hesitate and quibble and sometimes practically refuse by neglecting to give me the number and causes of death of their patients. The within is he best I can do, but it is incorrect: There have been 48 deaths in our village in the last year: One year and under, 3; between 1 and 20 years, 3; over 60 years, 24; of which number 5 were over 80 years; between 20 and 60 years, 18; total, 48.

This is the best I can do under the circumstances.

Sanitary condition is fairly good. No sewerage system in town. Not that I know of. Hauled out in carts and tanks between 9 P. M. and 5 A. M.

No trouble during the year. Contagious diseases are quarantined when they appear. About vaccination I do not know and cannot find out.

The board of health held one meeting during the year. Expenses during year, $2.50.

ELIDA, ALLEN COUNTY.

A. J. Myers, health officer.

Population (estimated), 350.

Streets, alleys and yards in clean condition. No reason for complaint on account of drainage. All nuisances are strictly done away with. Contagious diseases are properly reported. Number of children not vaccinated in school very small. Number of board meetings during the year two. Expenses none.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 2 cases; whooping cough, 5 cases; measles, 6 cases.

ELMORE, OTTAWA COUNTY.

S. T. Dromgold, M. D., health officer.

Population (estimated), 1,200.

Sanitary condition first-class in every particular. No trouble to abate nuisances.

Contagious diseases are promptly reported. A record is kept. None vaccinated to my knowledge. No meetings held specially, but the health officer and sanitary police look after the business. Money expended about $30.

No prosecutions. We claim as healthy, and the sanitary condition as good, as any town in the state.

ENON, CLARK COUNTY.

J. P. Pierce, health officer.

Population (estimated), 350.

No report.

Infectious diseases reported during the year: Diphtheria, 1 case; membranous croup, 1 case; measles, 1 case.

FAIRPORT HARBOR, LAKE COUNTY.

A. J. McCue, health officer.

Population (estimated), 1,500.

Sanitary condition of the town is good. No cause for complaint in regard to sewerage. Garbage and night-soil removed at night.

Contagious diseases are properly reported. Measles have been unusually prevalent. The board held one meeting. The expenses were $190.

Infectious diseases reported during the year: Whooping cough, 3 cases; measles, 39 cases.

FAIRVIEW, GUERNSEY COUNTY.

John H. Hunt, health officer.

Population (estimated), 400.

Streets, alleys and yards are cleanly. Have no sewerage, but good natural drainage. There are no nuisances unabated. It is the duty of every citizen to remove night-soil and garbage at his or her own expense, made so by ordinance, and it has been enforced.

Contagious diseases have been properly reported. No vaccinations this year, and out of 65 school children only 13 have been vaccinated, leaving 52 not vaccinated. No meetings of the board of health in the last year, but is organized and ready at any time to meet any emergency that might arise from contagious disease. No prosecutions; no money spent.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 2 cases.

FAYETTE, FULTON COUNTY.

Otis Ford, health officer.

Population (estimated), 900.

No contagious diseases. Very healthy, except la grippe.

Infectious disease reported during the year: Typhoid fever, 1 case.

FELICITY, CLERMONT COUNTY.

C. B. Altman, health officer.

Population (estimated), 900.

The sanitary condition of the village is good. There have been fifty school children reported vaccinated. Contagious diseases are properly reported and a record kept of the same. The board at all times has been able to handle cases requiring quarantine in a proper manner and without resort to law. There are twenty-two children attending school who have never been vaccinated.

There have been seven meetings of the board of health during the year. We will probably have a representative at the meeting of the State board of health in this month, and may offer some suggestions through him for improvements in our local boards of health. Our expenses for 1898 will not exceed $50.

Infectious disease reported during the year: Diphtheria, 1 case.

FINDLAY, HANCOCK COUNTY.

Amos Beardsley, health officer.

Population (estimated), 20,000.

Sanitary condition good. There is cause for complaint from the lack of sewerage, and from an improper discharge of sewage. There are no nuisances which have not been abated. The night-soil is removed outside the city limits and plowed under. Garbage is cremated.

Contagious diseases are reported. A record of such is kept. The board has been able to enforce restrictive measures. Scarlet fever has been most prevalent. There probably have been 200 persons vaccinated the past year; 2,500 unvaccinated children attending schools.

The board of health has held thirty meetings in the last year. The expenses incurred for 1898 were $2,418.42, including the running of the crematory.

One prosecution for dumping garbage in alley. He was fined $10 and costs, total $14.60.

Infectious diseases reported during the year: Diphtheria, 5 cases; membranous croup, 3 cases; scarlet fever, 91 cases; typhoid fever, 5 cases; whooping cough, 1 case; measles, 13 cases; other infectious diseases, 1 case.

FOSTORIA, SENECA COUNTY.

W. N. Caldwell, health officer.

Population (estimated), 10,000.

Our city is in splendid sanitary condition.

Our board has maintained an active organization, and has been successful in enforcing proper measures for prevention and growth of contagious diseases and the abatement of nuisances.

Our streets, alleys and yards are in a cleanly condition.

There has been no complaint from lack of sewerage. We have abated all nuisances successfully that we have attempted to abate.

Contagious diseases have been reported very satisfactorily. I have a record of all diseases reported. Measles is the most prevalent disease. Number of vaccinanations during the year of 1898 is estimated at 500. About 275 remain unvaccinated.

Our board has held six meetings during year 1898.

Expenditures of board of health for the year was $1,073.

No prosecutions during year.

No suggestions to offer for improvement of health board.

Infectious diseases reported during the year: Diphtheria, 4 cases; membranous croup, 1 case; scarlet fever, 5 cases; typhoid fever, 23 cases; whooping cough, 7 cases; measles, 85 cases.

FRANKLIN, WARREN COUNTY.

Dr. D. A. Williams, health officer.

Population (estimated), 3,000.

No report.

Infectious diseases reported during the year: Scarlet fever, 2 cases; typhoid fever, 5 cases..

FRAZEYSBURG, MUSKINGUM COUNTY.

Samuel McGinnis, health officer.

Population (estimated), 900.

The present condition of the village tolerable good. The board of health did not meet last year in regular meeting.

Has done nothing. I, as health officer, have done all the work myself. No one to help me. Could not get them to work with me.

I quarantined four houses in the year for scarlet fever. The mayor called the board of health together last Tuesday night, and appointed a new board of health and a new health officer without notice to me in any manner. I was appointed two years ago last spring, or in spring of 1896. Streets, alleys and yards are in good condition. Some complaint for want of sewerage. Means for removing night-soil and garbage not good. Contagious diseases have not been properly reported. Only one prosecution, brought for refusing to remove nuisance, and he was fined.

I have suggestions to make for improving the sanitary condition; that is to prosecute the board of health and make them do something. The board of health has not tried to abate any nuisances themselves; has done nothing.

Infectious diseases reported during the year: Scarlet fever, 10 cases.

FREDRICKSBURG, WAYNE COUNTY.

D. P. Shie, M. D., health officer.

Population (estimated), 1,000.

Sanitary condition of our village first-class, and an active organization has been maintained by our board of health.

We have been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances. Contagious diseases are promptly and properly reported, of which a record is kept. One hundred and fifty unvaccinated children are attending school. Have held four meetings. Total amount spent during year for sanitary purposes, $20.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 1 case.

FREDERICKTOWN, KNOX COUNTY.

W. W. Pennell, M. D., health officer.

Population (estimated), 1,000.

Our village is in a healthy condition. Contagious diseases are reported properly, though no record of such cases has been kept. Scarlet fever has been the only contagious disease in our village in the last year, there having been a number of cases.

Fully one hundred pupils have been vaccinated in the year. No pupils are now attending schools unvaccinated, except those (but few) who have been excused for cause by the physician.

Our board has met but few times and has had to expend no money for its purposes.

We think village health boards should be elected by the people same as the council is elected, for the reason its acts and orders would be the more cheerfully complied with. Several times persons have been known to not call a physician in a mild case of contagious disease, for fear of quarantine by a board over which the people had no direct choice in selecting.

FREMONT, SANDUSKY COUNTY.

O. C. Vermilya, M. D., health officer.

Population (estimated), 8,000.

Our streets, alleys and yards are in a cleanly condition as a rule and are under the inspection of sanitary policeman. We have few complaints from lack of sewerage. Residents have been advised by the health officer for some years to connect privy vaults and water-closets with the sewers as fast as possible. We have succeeded in abating all nuisances which were ordered abated, and in few instances have done the work and collected costs against the property.

Night-soil is removed at night in tight casks and deposited outside of the corporation limits. Garbage is dumped on a public dump and burned several times during the year.

Our board meets once a month. The entire expense of our board to the city is about $515. We had one prosecution for removing night-soil in daytime without a permit.

Our contagious diseases are reported and record kept of each. We have not experienced much difficulty in enforcing restrictive measures, quarantine, disinfection, etc. We had during the spring and early summer an unusually large number of cases of measles; no fatalities, however. We had compulsory vaccination of school children here in 1893, and none since, so that those pupils who have not been in school five years and over are, as a rule, unvaccinated.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 2 cases; scarlet fever, 10 cases; typhoid fever, 16 cases; whooping cough, 26 cases; measles, 97 cases.

GAHANNA, FRANKLIN COUNTY.

S. Cashner, mayor.

Population (estimated), 306.

No report.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 1 case; typhoid fever, 2 cases; whooping cough, 3 cases; measles, 15 cases; other infectious diseases, 5 cases.

GALION, CRAWFORD COUNTY.

C. F. Eise, health officer..

Population (estimated), 8,500.

Streets, alleys and yards in fairly cleanly condition. Board has not been able to abate "Pickle Run," open, filthy ditch, which should be sewered. Night-soil is removed by improved, odorless process, and conveyed to farms outside city limits.

Since present health officer assumed his duties, measures have been taken to have all contagious diseases reported. Scarlet fever has been most prevalent. Large proportion of school children are vaccinated.

Board of health held few meetings, because of lack of quorum. Present board holds regular meeting once a month, and has held several special meetings. Present board in good working order.

GALLIPOLIS, GALLIA COUNTY.

Dr. J. B. Alcorn, health officer.

Population (estimated), 6,000.

Six thousand includes Ohio Hospital for Epileptics patients.

Replying to your inquiry the sanitary condition of the city is very good. Regarding our board of health, we have had no organization since August 6, 1897. A short time after the present health officer was elected the city council asked for their resignations and the board was abolished, or no other was appointed, and the matter has so stood since with no health board. We have no sewerage system. Streets and alleys kept in a very fair condition. Contagious diseases are properly reported and a record kept of same.

Infectious diseases reported during the year: Diphtheria, 6 cases; membranous croup, 4 cases; typhoid fever, 13 cases; whooping cough, 5 cases; measles, 12 cases.

GENEVA, ASHTABULA COUNTY.

G. G. Biggar, M. D., health officer.

Population (estimated), 2,700.

Night-soil is taken out of town and composted. We have no sewerage. All nuisances have been abated. Contagious diseases are promptly reported and we quarantine fully. Superintendent of schools failed to get a good report of vaccinated children, but from the physicians I find less than twenty have been vaccinated. Fifteen meetings. This was due mainly to the fact that we were getting out new rules, and our expenses were therefore higher than they otherwise would have been. Total $199. No prosecutions. I am *Biggar* and they quit.

Infectious diseases reported during the year: Diphtheria, 4 cases; membranous croup, 1 case; scarlet fever, 5 cases; measles, 9 cases.

GERMANTOWN, MONTGOMERY COUNTY.

William F. Winter, health officer.

Population (estimated), 2,200.

Our streets and alleys are in good condition. There is no cause for complaint from lack of sewerage. We have nearly all surface drainage except several hundred yards on Main street. The sewers have enough fall, as well as the surface drainage, to carry the water away rapidly. Contagious diseases are properly reported. Typhoid fever has been more prevalent than usual. I do not think that there were any persons vaccinated during the year. The board of health had two meetings during the year. There has been no prosecutions brought by the board of health for violations of its rules or health laws. We have a man here we hire to haul all garabge and night-soil to a suitable place outside of the city limits.

Infectious disease reported during the year: Typhoid fever, 3 cases.

GIRARD, TRUMBULL COUNTY.

Dr. D. R. Williams, health officer.

Population (estimated), 3,000.

The drainage of the village is natural drainage into the Mahoning river, which keeps the village well drained. There is a natural water course running along the principal street over private property. This waterway is partly covered and partly uncovered. During a heavy rain it becomes full of water and washes down material which obstructs it, and as it is now it is an obstructed waterway and private sewer combined. The board of health has tried to remedy it for the last five years, but as yet has failed.

Streets and alleys are kept quite clean. The night-soil is removed by a scavenger appointed by the board of health, who takes it onto land outside of village, where it is plowed under. Garbage is taken to a dump one and one-half miles from village.

Contagious diseases are properly reported, and the same strictly quarantined. The most prevalent this year was whooping cough. There has been none vaccinated during the year. Out of an enrollment of over 600, there have been 74 vaccinated in our public schools, leaving about 526 unvaccinated.

There have been fourteen meetings held during the year. Two hundred and fifty-six dollars have been expended during the year.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 1 case; typhoid fever, 5 cases; whooping cough, 9 cases.

GLENDALE, HAMILTON COUNTY.

Clifford Allen, health officer.

Population, 1,444 (1890).

All streets, lanes and yards are in a cleanly condition. Sewerage good. Night-soil and garbage removed by private parties.

Contagious diseases are promptly reported and recorded. We have had no difficulty in enforcing all regulations. Four cases of diphtheria and nine of scarlet fever are the only contagious diseases we have had. Forty-four children have been vaccinated. No unvaccinated children are allowed to attend any of our schools.

Board meets once a month; amount spent, $200.

Five of the deaths under 1 year were at a foundlings' home.

Infectious diseases reported during the year: Diphtheria, 4 cases; scarlet fever, 9 cases.

GLENVILLE, CUYAHOGA COUNTY.

Andrew Carr, health officer.

Population (estimated), 5,200.

No report.

Infectious diseases reported during the year: Diphtheria, 6 cases: scarlet fever, 18 cases; typhoid fever, 5 cases; whooping cough, 14 cases; measles, 22 cases.

GLOUSTER, ATHENS COUNTY.

Dr. J. M. Rhodes, health officer.

Population (estimated), 3,000.

Streets, alleys, etc., in filthy condition. No sewerage. All these are nuisances which the board has tried to abate. No arrangement for the removal of night-soil or garbage.

Physicians pay little attention to reporting contagious diseases—such as measles, chicken-pox, whooping cough, and scarlatina. None vaccinated that I have heard of; 200 or 300 not vaccinated, many do not know meaning of vaccination.

Board meets last Saturday evening of each month, when there is any business to transact. Three meetings held this year. Total amount spent in year, $94. No prosecutions.

The only way to improve would be to eliminate from politics health authorities, and give them access to the funds necessary to make improvements that will produce satisfactory results. In this place there is nothing in the prosecution of such cases, as those who command the funds will not appropriate anything for carrying out advice or resolutions of health board. We have met with such persistent opposition by those who should assist us that we get along with as little as possible.

Infectious disease reported during the year: Scarlet fever, 3 cases.

GRAFTON, LORAIN COUNTY.

Jos. Hartman, health officer.

Population (estimated), 1,200.

Present sanitary condition is excellent. Board has maintained an active organization up to October 15, 1898. They have also been very successful in enforcing their rules and abating any and all nuisances they undertook to abate. The streets and alleys are in good condition. Sewerage good. Town is located on a hill, with the Black river a short distance away.

Contagious diseases are reported, but there are no books to keep a proper record. There have not been over fifteen persons vaccinated.

Held seven meetings. Total expenses, $42.25. No prosecutions.

I have this to suggest, at least for this town: It is almost impossible to get anything out of our council, especially money. The only thing I have for a record book is a small 7x9 book. Nothing to keep a record of births, deaths, or anything else, because the council will not buy the necessary books. On this account four members of the board of health resigned on the 15th of last October, and we have not had a meeting since.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 8 cases; whooping cough, 5 cases; measles, 3 cases.

GRAND RAPIDS, WOOD COUNTY.

Wm Mailey, health officer.

Population (estimated), 700.

Each case of complaint in regard to removal of night-soil receives attention.

No cause for complaint as far as sewerage is concerned.

Contagious diseases are reported promptly, unless it be typhoid fever and measles, and perhaps whooping cough, which have never been reported under contagious list.

To get reports of vaccination of school children it would be necessary to make it compulsory.

Infectious diseases reported during the year: Scarlet fever, 1 case; typhoid fever, 5 cases; whooping cough, 5 cases.

GREEN CAMP, MARION COUNTY.

W. C. Knickle, health officer.

The village of Green Camp is in good condition. We have not had any contagious diseases here. We have one case of cancer. The man has been suffering about ten years. It has eaten his face away. We have one case of kidney disease.

The board has held three meetings during the year.

The superintendent of schools said he did not think there were any children vaccinated.

The board of health has not spent any money.

GREEN SPRING, SENECA COUNTY.

Dr. H. L. S. Hinkley, health officer.

Population (estimated), 1,000.

We have an active board. Sanitary condition good. Contagious diseases are properly reported, also deaths and births, and a record is kept of the same.

I have nothing special to offer for the bettering of the board of health.

GREENVILLE, DARKE COUNTY.

Dr. John D. Kerlin, health officer.

Population (estimated), 6,500.

Our board of health meets regularly once a month, and is in good working order at present. I think our city is in a good sanitary condition. Our night-soil is hauled to the country and plowed under.

Our physicians are prompt in reporting contagious diseases, but very careless in reporting births. We are carrying out our quarantine regulations to the letter, and have no cause for complaint. Have had no arrests or convictions for violations of sanitary laws.

I am now insisting on the school board having scholars vaccinated, although it was thoroughly done here a few years ago when we had a scare.

We have expended probably $300 (estimated).

Infectious diseases reported during the year: Diphtheria, 8 cases; scarlet fever, 6 cases; typhoid fever, 1 case.

GREENWICH, HURON COUNTY.

F. L. Ward, health officer.

Population (estimated), 1,000.

Our board of health has been very careless the last year. The board never meets and the physicians never report deaths.

GROVE CITY, FRANKLIN COUNTY.

E. S. Grant, health officer.

Population (estimated), 800.

No report.

Infectious diseases reported during the year: Diphtheria, 1 case; scarlet fever, 1 case; measles, 6 cases.

GROVER HILL, PAULDING COUNTY.

G. H. Hays, health officer.

Population (estimated), 900.

The sanitary condition is only fair. This board has met five times. We organized in May last. There have been quite a number of nuisances removed. Have no arrangements for removing night-soil.

Have had no trouble in regard to contagious diseases. Streets and alleys are not kept as clean as they should be. Have had some trouble to get alleys put in proper shape. There needs to be considerable underdraining done. Have been improving underdraining myself about the town this summer. I think there will be some special draining to do this spring. I think all contagious diseases are reported and a record is kept of the same.

Infectious disease reported during the year: Scarlet fever, 5 cases.

HAMDEN JUNCTION, VINTON COUNTY.

Geo. A. F. Smith, health officer.

Population (estimated), 1,000.

Sanitary condition of village is fairly good. No sewerage at all, depend on street gutters. We have them cleaned as often as possible. Stables and manure piles give us the most bother.

Contagious diseases have been properly reported and a record kept.

It is almost impossible to get the board together after they are sworn in. We have had only two meetings in the year. All is left to the health officer. About $8 has been expended.

Infectious diseases reported during the year: Diphtheria, 2 cases; scarlet fever, 3 cases; measles, 1 case.

HAMLER, HENRY COUNTY.

N. J. Blinn, health officer.

Population (estimated), 700.

Sanitary condition of village is good, Our board has maintained an active organization, and has been reasonably successful in enforcing measures for the prevention of contagious diseases, and the abatement of nuisances. Streets, alleys and yards are kept in fair condition. Some cause for complaint in regard to sewerage. No nuisances that we have had trouble with. Most of the night-soil is carted to the country and used for fertilizing.

Contagious diseases are properly reported. No record is kept of contagious diseases. The board has been able to enforce proper restrictive measures. No one to our knowledge has been vaccinated during the year. About 150 pupils have been reported by the superintendent who attend school who are not vaccinated.

The board has held four meetings since their organization, May 15, 1898.

The board has spent about $20.

Infectious diseases reported during the year: Typhoid fever, 10 cases.

HANGING ROCK, LAWRENCE COUNTY.

Joseph Kinkaid, health officer.

Population (estimated), 550.

The board has maintained an active organization, and been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances.

Streets and alleys are in very good condition.

Contagious diseases are not always reported at once.

There were ten children vaccinated during the year. Eighty-five attending school not vaccinated, as far as I can find out.

No prosecutions brought by the board of health.

Spent about $87.

Infectious diseases reported during the year: Diphtheria, 11 cases; membranous croup, 3 cases; scarlet fever, 2 cases; typhoid fever, 8 cases; whooping cough, 5 cases.

HANOVERTON, COLUMBIANA COUNTY.

Dr. George E. Lewis, health officer.

Population (estimated), 450.

Streets and alleys are in very good condition. Drainage is as good as the lay of the land will permit.

The board has not tried unsuccessfully to abate any nuisances. Two have been abated.

So far as I know there were no vaccinanations during the year. Cannot report number of unvaccinated children. I inquired of one of the teachers, but he made no report; but there are very few, if any.

There were no contagious diseases in the town during the year.

The board of health held four or five meetings during the year. No money was spent and no prosecutions brought.

HARTWELL, HAMILTON COUNTY.

O. W. Butler, health officer.

Population (estimated), 2,000.

The sanitary condition of our village is, I think, good beyond the average. Streets, alleys and yards are generally cleanly. Have heard of no cause of complaint from improper discharge of sewage, and know of no nuisance which the board has been unable to abate. Night-soil and garbage are removed by wagons, and carried outside the corporation limits.

Contagious diseases are promptly reported, and the board has succeeded very well in carrying out the proper restrictive measures We have been remarkably free from contagious diseases during the year. No record has been kept, but I shall keep one from the time of my appointment as health officer. Number vaccinated estimated at about 350. Number of unvaccinated children in schools is probably very small.

The board of health has had but few meetings during the year. I have no access to the secretary's books, and, as I have been health officer only since December 8, cannot answer positively as to the number of meetings and total amount expended. There have been no prosecutions brought by the board. Our people, as a rule, readily consent to the requirements and restrictions of the board, and most of them aid us cheerfully and intelligently.

Infectious diseases reported during the year: Scarlet fever, 3 cases.

HARVEYSBURG, WARREN COUNTY.

J. E. Witham, health officer.

Population (estimated), 450.

Our health board never completed its organization; therefore, having no authority I have never done anything as health officer.

HICKSVILLE, DEFIANCE COUNTY.

Nelson Smith, health officer.

Population (estimated), 2,500.

The present sanitary condition of the village is good. Streets, alleys and yards are clean and have been kept so during the year. The board has maintained an active organization during the year, and has been very successful in abating all nuisances complained of, and has been cheerfully supported by the citizens of the village in all its efforts for the prevention of the spread of contagious diseases as well as the diseases themselves. The village has a good system of water works, and the danger from diseases originating from impure water is greatly lessened. There is some cause of complaint in regard to sewerage. The town has no regular system of sewerage. It has been for several years putting in covered ditches to carry off surface and waste water, at an expense of thousands of dollars. Some open ditches have been in bad condition during the wet periods of the year, but have been cleaned as rapidly as the finances of the village would permit. The matter of removing night-soil and garbage is in the hands of the health officer and the same is disposed of at his direction. All night-soil is required to be moved outside the corporate limits after night, and is required to be moved in tight barrels or boxes. The village physicians are somewhat derelict in reporting contagious diseases as well as deaths and births. A record of such as have been reported has been kept by the clerk of the board. I am of the opinion that a few prosecutions of physicians neglecting this duty would be beneficial and secure promptness in reporting, as required by law. The prevailing contagious disease in the village has been the measles. Only on death has occurred, however, from the many reported as having the disease. There has been no system of vaccination enforced by the board, and if any children have been vaccinated it was done at the instance of their parents. The danger of an infection of smallpox in the village is remote, and the board has not so far felt itself justified in ordering a sweeping system of vaccination. The number of children attending the public schools who are not vaccinated is 150. The board of health has held twelve meetings during the year, all that have been deemed necessary. The health officer has been indefatigable in his efforts to keep the village in good sanitary condition, in which he has been assisted and sustained by the board. The amount of money expended by the board during the year was $86. No prosecutions for violations of the rules of the board were instituted during the year. Citizens have cheerfully complied with the orders of the board, and we have had no trouble. If the board had a fund of its own the sanitary condition of the village could be much bettered, but being dependent upon the village council for funds to defray its expenses, they have necessarily been limited to the smallest amount possible. The board is now considering the propriety of making a levy for its own use in the coming spring.

Infectious diseases reported during the year: Typhoid fever, 3 cases; measles, 48 cases; other infectious diseases, 4 cases.

HILLSBORO, HIGHLAND COUNTY.

S. R. Howard, V. S., health officer.

Population, (estimated), 4,000 to 4,500.

Our board of health has maintained an active organization, and has been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances.

Our streets, alleys and yards are comparatively clean.

There is cause for complaint from an improper discharge of a *county* sewer in corporation limit. This drains county jail, court house and divers other places

This empties into a large cesspool and then flows out into an open ditch toward a very small stream about one-fourth mile distant. The county commissioners and common council are now wrestling with this problem: "What shall we do with it?"

We publish occasionally a notice to clean up yards, cellars, pig pens, and serve notices on individuals to have vaults and stables cleaned. Sanitary policeman promptly investigates and reports all complaints.

We have no particular system of disposing of night-soil, only that it be removed outside of city limits. Considerable is deposited, I believe, in an out-of the-way field and buried.

Contagious diseases are properly reported and records kept. None, or comparatively few, have been vaccinated this year. Of 900 school children 60 per cent. have in past years been vaccinated, so the superintendent informs me.

The board of health has not prosecuted anyone this year.

Have had twelve meetings this year.

Board of health spent $397.62 in 1898.

HOLLANSBURG, DARKE COUNTY.

Dr. A. W. Meek, health officer.

Population (estimated), 500.

We are at present organizing a board of health and will soon have matters in shape. Heretofore the board has consisted of three councilmen, and sanitary affairs have been in their hands with reasonably satisfactory results.

Infectious diseases reported during the year: Scarlet fever, 6 cases; whooping cough, 4 cases.

HOLMESVILLE, HOLMES COUNTY.

Edgar Cole, M. D., health officer.

Population (estimated), 400.

Our board of health of Holmesville has been established only sixty-five days up to December 31, 1898.

Sanitary condition is good. Garbage removed two or three times a year.

Contagious diseases are properly reported and a record of such diseases kept. Scarlet fever has been the most prevalent. No report that there have been any vaccinated. Very few school children but what have been vaccinated.

We have had several meetings, will settle down to two regularly.

About $35 has been spent.

There were no prosecutions during year.

Infectious diseases reported during the year: Scarlet fever, 4 cases; typhoid fever, 4 cases; measles, 1 case.

HOYTVILLE, WOOD COUNTY.

Population (estimated), 400.

There is no board of health here. The council disbanded it. The sanitary condition is moderately fair. There are some being vaccinated. When I receive any literature from State Board I distribute it.

Streets and alleys are looked after by council.

Contagious diseases are reported to the corporation clerk by the doctors.

I believe we should have a health board in case that the smallpox should come again.

(Signed) C. F. Bell.

HUBBARD, TRUMBULL COUNTY.

Dr. W. H. Button, health officer.

Population (estimated), 1,000.

Streets, alleys and yards are in a fair condition as to cleanliness. There has been some complaint with the sewerage, and the board succeeded in improving the condition in several cases.

The arrangement for the removal and disposal of night-soil is very meager. Will try to improve in that respect.

Our physicians are very lax in reporting contagious diseases. A record of such diseases is kept. Whooping cough is the only contagious disease that has been unusually prevalent. Have had two cases of diphtheria, and none of scarlet fever, in the village. There have been only two vaccinated in the last year that I know of. The great majority of the school children are vaccinated.

The board has held four meetings during the year. Total amount spent by board, $51. There has been no prosecution brought by the board.

Infectious diseases reported during the year: Diphtheria, 2 cases; typhoid fever, 3 cases; whooping cough, not reported, probably 50 cases.

HUDSON, SUMMIT COUNTY.

G. L. Starr, M. D., health officer.

Population (estimated), 1,100.

Our sanitary condition is good. The local board has maintained active measures, regular meetings, and sustained the health officer in careful observation and care that proper isolation of patients is had and thorough quarantine of houses and families where contagious diseases were found, in every case where knowledge of conditions was possible. Success in limiting spread of epidemics has thus been accomplished, and the number of nuisances very much lessened, and abated.

Streets, alleys and yards are kept free from garbage, weeds and other nuisances. Sewerage is adequate, night-soil is removed to farms outside the village, or in some instances buried on premises, under direction of sanitary policeman. Garbage is removed to outside ditches which require filling.

Contagious diseases are reported by physicians having cases. Occasionally families, having no physician, endeavor to evade quarantine by striving to hide the fact of any disease being present. They are almost universally found out before there is chance of exposing others, and the red card nailed on the door; record of cases is kept, and at the proper time fumigation by sulphur thoroughly carried out before patients are released from quarantine. Measles have prevailed the past year. Not many have been vaccinated, no public requirement having been made, in absence of smallpox cases.

Local board has held monthly meetings regularly, unless possibly one missed; spend about $65 per year.

The most efficient boards are composed of intelligent, public-spirited citizens, prompt at meetings, and ever ready to afford the health officer and sanitary policeman the support needed in their arduous duties.

Infectious diseases reported during the year: Diphtheria, 1 case; scarlet fever, 10 cases; measles, 72 cases.

HUNTSVILLE, LOGAN COUNTY.

Dr. J. S. Montgomery, health officer.

Population (estimated), 600.

Streets and alleys are kept in fair condition.

Contagious diseases are properly reported. No record kept as yet. Scarlet fever has been more prevalent than usual. Number vaccinated during year about 300. Only one at present attending public schools that has not been vaccinated.

About three meetings have been held during the year. No prosecutions were brought during year.

In small villages the fund for sanita y purposes should be set aside and not used for other purposes, as it is in our village, and other villages that I know of.

Infectious disease reported during the year: Scarlet fever, 20 cases.

HURON, ERIE COUNTY.

S. N. Lennon, health officer.

Population (estimated), 2,000.

No report.

Infectious diseases reported during the year: Diphtheria, 6 cases; typhoid fever, 4 cases.

HYDE PARK, HAMILTON COUNTY.

Arthur L. Brown, M. D., health officer.

Population (estimated), 1,600.

The sanitary condition of the vil age is excellent. The natural drainage is splendid, and the present sewerage system answers all requirements.

There have been so few cases of contagious diseases that we have had no trouble in controlling them. There has been no epidemic of any disease during the year just past. We have had several cases of scarlet fever, some few of measles.

We have no organized system for the removal of garbage. Individual families handle their own, usually burning it, on the advice of the board of health, which in its circular, advised such disposal.

It is impossible to ascertain the number of children vaccinated, as we have here but one school, and that has a district taking in a portion of the city of Cincinnati. We are, in fact, in the Cincinnati school district.

Our board has held but two meetings during the year. The expenditures for the year were $53.25.

Infectious diseases reported during the year: Membranous croup, 1 case; scarlet fever, 4 cases; measles, 5 cases.

IRONTON, LAWRENCE COUNTY.

Dr. E. E. Wells, health officer.

Population (estimated), 12,952.

The board of health of the city of Ironton has met the first Monday of each month the past year. Have had no cause for prosecutions.

There have been no vaccinations during the year.

The streets and alleys are only in fair condition, there being room for improvement in the way of drainage, as the sewer system is not yet completed, but garbage is hauled away daily, and night-soil is removed only when vaults are cleaned, and but occasionally one is cleaned, as new ones are dug instead, the depth being an average of forty feet.

Have had no trouble securing reports of infectious diseases, but premature and still-births have been neglected as far as reporting to health officer. Typhoid fever has been most prevalent.

The city council at the present time are making arrangements to furnish filtered water, as our supply comes from the Ohio river.

Infectious diseases reported during the year: Diphtheria, 8 cases; scarlet fever, 3 cases; typhoid fever, 85 cases; measles, 3 cases.

JACKSON, JACKSON COUNTY.

W. H. Williams, health officer.

Population (estimated), 6,000.

The streets and alleys are in a fairly good condition. About all the surface drainage very unsatisfactory, especially in dry weather, but we expect that to be remedied, as we have voted on water works and it has carried. Board has abated all nuisances they have gone after. Permits are issued to parties who remove night-soil, which is hauled outside of the corporation and buried.

Contagious diseases are reported in most instances. One of the doctors, a member of the board, does not report all cases, as he claims they are not, when other doctors in the city claim they are. A record of scarlet fever and diphtheria has been kept, as that is all we have had to contend with lately. Restrictive measures have been enforced. Diphtheria has been most prevalent. None have been vaccinated that we know of.

Board of health has held fifteen meetings and expended $312.

There have been two prosecutions, both for violating rules in regard to the disposition of night-soil. They were arrested, fined and sent to jail.

Infectious diseases reported during the year: Diphtheria, 28 cases; membranous croup, 4 cases.

JACKSONVILLE, ATHENS COUNTY.

Dr. John Stamm, health officer.

Population (estimated), 1,000.

The sanitary conditions are good. The board has maintained an active organization; it has been successful in enforcing proper measures for the prevention of contagious diseases and abatement of nuisances.

All streets, alleys and yards are in cleanly condition.

No complaints from lack of sewerage. The city has made contract with a certain party for a dumping ground and disposition of night-soil.

The contagious diseases were not properly reported, but arrangements have been made that they will be reported hereafter.

No record has been kept of same, but will be done this year.

The board has been able to enforce proper restrictive measures.

Measles and whooping cough have been very abundant.

Cannot ascertain number of persons vaccinated during last year.

Number of unvaccinated children attending public schools, 90. Number of meetings, 6. Total amount spent, $6.75. No prosecutions brought by board.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 6 cases.

JENERA, HANCOCK COUNTY.

C. H. Heldman, health officer.

Population (estimated), 300.

The board has had four meetings. There has been some complaint about the railroad bridge backing up the water in cellars, which can be no other but unhealthy. Every time the water raises it is from six to eighteen inches lower on one side of the railroad than it is on the other. There are eight spile drove in the ditch, where nearly every thing lodges against and causes the water to back up in cellars, which makes it very unhealthy.

No arrangements yet for removal of night-soil.

There has been no diseases this year. It has been very healthy here the last year.

Total amount spent, $62.

JERRY CITY, WOOD COUNTY.

Uriah Shasteen, health officer.

Population (estimated), 500.

Our village is in a good sanitary condition. Our streets, alleys and yards in a cleanly condition for this time of the year.

Contagious diseases are promptly reported. We have had no contagious diseases in the village in the last year.

The children of our schools have not been vaccinated. The number of pupils here is about 180.

The board of health has had three meetings.

Our expenses have been nothing only for postage.

JUNCTION CITY, PERRY COUNTY.

Dr. J. A. Moody, health officer.

Population (estimated), 500.

Our board of health has maintained an active organization during the past year. We have had no contagious or infectious diseases to enforce proper measures against. Our streets, alleys and yards have been kept in an excellent sanitary condition, by the demands of our board of health upon the village council, with very little trouble or inconvenience to us. We have no sewerage system, but have maintained good, free, surface drainage within the entire corporate limits.

We have held ourselves in readiness to act in the event of the appearance of any contagious disease.

We have not attempted to enforce vaccination; in fact, there has been no vaccinating done here, as there has been no cases of smallpox reported nearer than twenty miles of us.

We have had no prosecutions for violations of the "health laws," and no money has been spent by the board of health except the salary of the health officer, $30, and the secretary, $20; total $50, during the past year.

I have no suggestions to make relative to improving the present form of the health boards. I think the law is good enough as it now is, and perfectly efficient if properly enforced.

Infectious diseases reported during the year: Diphtheria, 3 cases; membranous croup, 5 cases; typhoid fever, 12 cases.

KENT, PORTAGE COUNTY.

L. G. Reed, health officer.

Population (estimated), 4,000.

The sanitary condition is very good with a few exceptions. We have a full membership of the board of health, but they, as a body, are not active enough to the notion of the health officer. They seem indifferent; that is to say, some of them, and that has a tendency to hold the others back. House slops being discharged into our streets and alleys is our greatest trouble, on account of no system of sewerage presumably. Slaughter houses outside of the village limits is another bad one. I am now working hard to have the Warren, Ohio, sanitary code adopted here; that is a enough of it meet our requirements, with some show of success. The only drawback I have is to get the board together to do business.

No special arrangement for the disposal of garbage and night-soil. Any one can, or is allowed to do such work, who chooses to do it.

Contagious diseases excepting whooping cough are pretty promptly reported, though we have had very little of it except measles, until very recently a few cases of diphtheria; but it is the opinion now that we have wiped it out. The disease originated in the country in an old house, where the disease broke out several years ago. The children from this house attended the village public school, and all five of the cases came down from the room in which they sat. During the present two weeks' vacation I thoroughly disinfected this room by burning 100 pounds of sulphur therein. The disease was very severe; three deaths in all; one outside of the village and two inside.

The board only held five meetings during the year. Amount expended for all sanitary purposes, including salaries, was $181.70.

I do not know as I have any suggestions to offer for improving the form of boards of health. They seem to be an inactive, inoperative, dormant organization, I am told, throughout all the smaller towns of the State, except in special cases where their own interest is at stake. Sometimes I am completely discouraged and disgusted with the whole thing. Of course they are usually made up of business men, and they are afraid to act, fearing injury of business. If they could be paid a stipulated sum for actual service rendered, it might act as a sort of a stimulus, but I am told this would breed corruption, and corruption is what we are fighting, but not political corruption, however, of which there is an immense quantity.

Infectious diseases reported during the year: Diphtheria, 5 cases; measles, 51 cases.

KENTON, HARDIN COUNTY.

F. H. Fall, health officer.

Population (estimated), 9,000.

No report.

Infectious diseases reported during the year: Diphtheria, 21 cases; scarlet fever, 2 cases.

KILLBUCK, HOLMES COUNTY.

Dr. T. A. Ablet, health officer.

The board abated fifty-nine nuisances during the year. The hog pens, with the exception of a few, have been kept in good condition. What shall we do with the ones who refuse to keep their pens in a sanitary condition? We do not want to put them all out of the village if we can avoid it.

We have had no contagious diseases to contend with. We have only been organized since June 1, 1897.

Board has held four meetings and spent $4.50.

KINGSTON, ROSS COUNTY.

Dr. C. C. Hatfield, health officer.

Population (estimated), 1,000.

No report.

Infectious diseases reported during the year: Scarlet fever, 2 cases; typhoid fever, 5 cases; whooping cough, 5 cases; measles, 10 cases.

KIRBY, WYANDOT COUNTY.

E. E. Burns, M. D., health officer.

We have had so few contagious or infectious diseases that no special action was taken, except cleanliness and to exclude visitors.

We have privies cleaned every spring, and hog pens kept clean, especially during hot weather.

Our board is not very active. Our village is small, so the business is left to the health officer, and he is not paid, except expenses.

KOSSUTH, AUGLAIZE COUNTY.

T. J. Barnett, health officer.

Population (estimated), 200.

The expenses of the village board of health for the year were $18.40.

Present sanitary condition good. Board has maintained an active organization and has been successful in enforcing measures for the prevention of contagious diseases. Contagious diseases partly reported to board and the doctor warned not to repeat the offense again or the board would prosecute to the full extent of the law. The same has been reported to you in the past, which you will see.

Diphtheria unusually prevalent.

Board held twelve meetings. A record of contagious diseases is kept.

Infectious diseases reported during the year: Diphtheria, 5 cases.

LAKEWOOD, CUYAHOGA COUNTY.

A. E. McClure, M. D., health officer.

Population (estimated), 3,000.

No report.

Infectious diseases reported during the year: Diphtheria, 7 cases; membranous croup, 3 cases; scarlet fever, 5 cases; typhoid fever, 2 cases; whooping cough, 15 cases; measles, 150 cases.

LANCASTER, FAIRFIELD COUNTY.

F. P. Stukey, M. D., health officer.

Population (estimated), 9,000.

Our streets, alleys and yards are in a very fair condition. There is some reason for complaint from a lack of sewerage, and also from an improper discharge of sewage. The board has been very successful in abating nuisances. No arrangement has been made for the removal and disposition of night-soil and garbage.

Contagious diseases are properly reported and a record of the same is kept. The board has been able to enforce restrictive measures. Chicken-pox and measles have been unusually prevalent. Between 700 and 800 were vaccinated. Between 200 and 300 children unvaccinated are attending our schools, most of these are very young.

The board of health held eleven meetings during the year. A total of $656.75 was expended, $400 of which was paid to the physicians for treating the sick poor of the city. The board had one case of prosecution for violating section 6923 of the health laws. The defendant was fined $10 and costs, and the board was well pleased with the results.

I have no suggestions to offer for improving our present health boards.

Infectious diseases reported during the year: Scarlet fever, 10 cases; smallpox, 1 case; chicken-pox, 15 cases.

LEBANON, WARREN COUNTY.

Thomas Starry, health officer.

Population (estimated), 3,500.

We regard the condition of our streets, yards and alleys as cleanly. Much complaint was made on account of the poor drainage of certain cellars situated on one of the principal streets of the village, but a sewer or drain, at a cost of something over $1,000, was put in this winter. The expense of this is upon the property adjacent. There are no nuisances which the board has not been able to abate. The removal of night-soil is under control of the board, and is done within prescribed hours, and the garbage is removed daily.

Contagious diseases are promptly and properly reported, and a record made of same. Scarlet fever prevailed in the first part of 1898.

Cannot give an estimate of vaccination; think little has been done, although the board recommended it last fall.

The board had nine meetings during the past year, and the total expenditure was $144 70.

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 18 cases; typhoid fever, 1 case.

LEETONIA, COLUMBIANA COUNTY.

Dr. H. B. Kurtz, health officer.

Population (estimated), 4,000.

Streets and alleys are in fairly good condition. No cause for complaint from lack of sewerage. The board has successfully abated all nuisances. Night-soil removed in air-tight barrels.

Contagious diseases are properly and promptly reported, and a record is kept at the health office.

The board has not failed to enforce proper restrictive measures. Diphtheria and typhoid fever have been unusually prevalent — probably twelve or fifteen cases.

One meeting per month, regular amount expended during year being $260. There were no prosecutions during the year. Have no suggestions to offer.

Infectious diseases reported during the year: Diphtheria, 18 cases; membranous croup, 1 case; scarlet fever, 8 cases; typhoid fever, 14 cases; measles, 8 cases; chicken-pox, 3 cases.

LEWISBURG, PREBLE COUNTY.

E. E. Black, health officer.

Population (estimated), 800.

You ask what the board of health of this place has been doing the past year. They have met but very few times, as there has been but very little work for the board of health to do outside of the health officer's duty. There has been but very few contagious diseases, and I, as health officer, have seen that the streets, alleys and yards have been kept in healthy condition. The night-soil and garbage have been properly attended to, according to directions of the board.

The amount of expenses of board of health during year 1898 amounted to $6.37.

Infectious diseases reported during the year: Whooping cough, 7 cases; measles, 2 cases.

LEXINGTON, RICHLAND COUNTY.

Dr. H. H. Smith, health officer.

Population (estimated), 500.

There has been but one case of infectious or contagious disease reported to me, and that was a case of scarlet fever, which has been prevalent in the country outside of the corporation. While strict quarantine measures are enforced, it is remarkable that we have escaped so well, colds and grip being the principal diseases throughout the year. There seems to be greater difficulties in enforcing regulations in the country than in town, and I have found some families in the country making butter in the same room where children were sick with scarlet fever. This butter would have gone into the markets had I not objected. I have reason to believe that food products are often sources of contagion. Provision stores are open to the public, and one infected person in such place might leave the germs to be handed out systematically to a whole village. When we would say this or that disease is endemic in such and such a town or village, not suspecting the source of infection, I even believe that good culture media can be found in all these places. I also believe it to be the duty of boards of health to inspect all such places, and remove all substances which would support bacterial growth as far from public contact as possible. It is here that disease is peddled from the country to the town, and again back to the country. I do not wish to convey the idea that this is the only source of infection, but one of many other avenues not to be lightly considered.

Infectious disease reported during the year: Scarlet fever, 1 case.

LIMA, ALLEN COUNTY.

L. F. Laudick, M. D., health officer.

No report.

Infectious diseases reported during the year: Diphtheria, 21 cases; membranous croup, 1 case; scarlet fever, 10 cases; whooping cough, 1 case; measles, 94 cases.

LITHOPOLIS, FAIRFIELD COUNTY.

Edwin S. Stotz, health officer.

Population (estimated), 500.

The Lithopolis board of health organized October 10, 1898, since which four meetings were held. During this time the board has kept an active organization, although they have not had any expenses to report this year. They have ordered necessary blanks, and have had the law published in our home paper. We have no cause to complain as to the sanitary condition of our village, and no nuisances to abate.

We have had during our organization one case of contagious disease (scarlet fever), which was properly reported by the visiting physician and the family quarantined.

LOCKINGTON, SHELBY COUNTY.

Jacob Everley, health officer.

Population (estimated), 300.

The sanitary condition of our village is good—streets and alleys clean.

Scarlet fever was the only contagious disease prevalent this year.

The board has maintained a good organization throughout the year and thoroughly enforced quarantine regulations when required.

We have expended probably $25 during the year.

A few children have been vaccinated. There are probably thirty unvaccinated pupils in the school.

Infectious diseases reported during the year: Scarlet fever, 6 cases.

LOCKLAND, HAMILTON COUNTY.

Dr. B. H. Timberman, health officer.

Population (estimated), 3,500.

Streets, alleys and yards are in a cleanly condition. There is a cause for complaint from lack of sewerage and from improper discharge of sewage. There are no nuisances the board was unsuccessful in having abated. Night-soil is buried four feet underground. Garbage is removed.

Contagious diseases are properly reported, and a record kept. Proper restrictive measures are enforced. No contagious disease unusually prevalent.

LOGAN, HOCKING COUNTY.

Dr. N. H. Blosser, health officer.

Population (estimated), 3,500.

The sanitary condition of our town is better than it has ever been. The board has kept up its organization and taken prompt action in all matters that came under its supervision, and abated all nuisances that were reported or otherwise discovered, and succeeded in all without litigation. Night-soil and garbage are removed to places beyond the corporation limits.

Contagious diseases are pretty generally reported. I have no book furnished to keep the record. Please send me sample leaf of record and I will have one ordered. My predecessors kept no record, hence no book. Quarantine is easily enforced. The only prevailing contagious disease was measles, not nearly all reported, approximate number of cases 520, one death. Epidemic has subsided for want of material. I know of only three vaccinations during the year. Number of unvaccinated children in schools, 350, enrollment, 746.

Board held thirteen meetings during the year. No prosecutions. Total amount spent by board during the year $209.45. Total number of contagious diseases reported during the year, 525.

The good sanitary condition of our town is shown by the fact that no disease assumes a malignant form. The milder type is the prevailing one in all diseases.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 2 cases; whooping cough, 2 cases; measles, 520 cases

LOUDONVILLE, ASHLAND COUNTY.

Wm. Conrad, health officer.

Population (estimated), 1,500.

Within the year 1898 there have been nine regular meetings and six special meetings, besides about thirty meetings of special committees.

Infectious diseases reported during the year: Scarlet fever, 3 cases; typhoid fever, 2 cases; measles, 2 cases.

LOUISVILLE, STARK COUNTY.

C. A. Walker, M. D., health officer.

Population (estimated), 1,500.

Streets, alleys and yards are in a cleanly condition.

The village is in need of sewerage.

Diphtheria unusually prevalent.

No provision for garbage.

Contagious diseases are reported and records kept. Proper restrictive measures enforced.

Number vaccinations in village, two.

Expense in village, about $50.

No prosecutions.

I would suggest that each town and township health officer be furnished with a formaldehyde lamp and furnished the chemical. That the health officer of a village with a population of 1,500 be paid a salary of not less than $75, and that it shall not be a matter of the lowest bidder.

Infectious diseases reported during the year: Diphtheria, 4 cases.

LOVELAND, WARREN, CLERMONT AND HAMILTON COUNTIES.

Dr. L. W. Bishop, health officer.

Population (estimated), 1,500.

All the streets and yards are in a cleanly condition. The alleys might be improved. We have no sewerage in our village. There are no nuisances but those which we have been successful in abating. Night-soil and garbage are either removed by carts or covered over with earth.

All contagious diseases are properly reported. No record is kept of such diseases. We have never attempted to enforce restrictive measures. Smallpox and whooping cough have been prevalent here for the past year. About 200 persons have been vaccinated during the past year. All children in the schools have been vaccinated except those who have had smallpox.

The board of health has had twelve meetings, all of which were held during the months of November and December. Two hundred and fifty dollars ($250) have been spent by the board during the year. There have been no prosecutions for the violation of health laws.

I am unable to answer as to the mortality report, as no record has been kept. The board has not had any regular meetings, except during the prevalence of smallpox. We hope in the future to have a meeting every month and to be better prepared to make an annual report in the future than we have in the past.

LYNCHBURG, HIGHLAND COUNTY.

C. A. Michael, health officer.

Population (estimated), 1,000.

Sanitary condition of our village is satisfactory. The board has had no trouble in abating nuisances.

Night-soil is removed in barrels or boxes to the country, limed and sometimes buried.

There have been no contagious diseases during the year.

Superintendent of public schools report 119 unvaccinated pupils out of an enrollment of about 200. But very few vaccinated during the year.

The board is supposed to meet once a month, but sometimes failed to meet. Expended $48.

MARBLEHEAD, OTTAWA COUNTY.

A. J. Clemons, health officer.

Population (estimated), 1,200.

Sanitary conditions in the village are not good, for lack of proper sewerage.

MAGNOLIA, STARK COUNTY.

William Judd, health officer.

Population (estimated), 400.

Sanitary condition good.

Streets, alleys, etc., condition above average. Sewerage good. Nuisances none.

Night-soil mostly deposited in privy vaults. Contagious diseases, none reported. Vaccinated, none. Meetings four.

I would state that the doctors of the place have not reported a birth nor a death to the board this last year, although they have been requested to do so, but neglected it.

MARIETTA, WASHINGTON COUNTY.

Dr. B. F. Hart, health officer.

Population (estimated), 15,000.

Streets, alleys and yards are in fair condition. There is room for much improvement and decided progress is being made. There is cause for much complaint from lack of sewers. Districts owned by well-to-do landlords are probably the greatest sufferers. Landlords do not care for sewers in streets where rents are low, hence a great deal of trouble with privies and liquid refuse. During 1898 there were no arrangements for the removal of garbage and night-soil. By our code of rules, passed December 5, 1898, the manner of removal is regulated and permits required. It seems impossible to stop cleaning of privies after dark and burying night-soil in back yards.

Contagious diseases are not properly reported, and only to a limited extent has the board been able to enforce restrictive measures. No particular contagious disease has been more prevalent than usual. It is, in my mind, doubtful whether the contagious diseases reported in mortality reports were, in the majority of cases, genuine. Probably much of the "croup" and "diphtheria" should be reported as "tonsilitis," and "typhoid" as "malaria." Have no means of estimating the number vaccinated during the year. Probably of the 2,400 school children at least 1,600 are unvaccinated.

During the year 1898 the board held fourteen meetings. The total expense was $813.41. The board has brought no prosecutions.

As tending to improvement, would suggest that, in cities of this size, much better work could be done if more power was given the health officer. Too much delay is occasioned by waiting for the action of a quorum of the board in the matter of declaring nuisances and ordering abatement and then citing the defendant to appear, etc. It not infrequently happens that matters which should be given *immediate* attention drag along for two or three months, owing to slow action of the board, lack of quorums at meetings, etc. During 1898 there were seven meetings called to which not a quorum appeared. The health officer should be able to institute prosecutions and push them through. This would make him more active, the board more careful in his selection, as they would of course be responsible for his acts and, what is best, the people would see that they *must* obey. Members of boards should receive a small salary and then be *fined* for non-attendance at meetings, etc.

The regulations, or standing orders, passed by this board December 5, 1898, are largely patterned after those of Warren, O., and will probably be published in pamphlet form, a copy of which will be sent you. New blanks, in use since January 1, 1899, are enclosed.

Infectious diseases reported during the year: Diphtheria, 2 cases; scarlet fever, 9 cases; typhoid fever, 14 cases; measles, several cases.

This record of contagious diseases is made up from the board's minutes, the health officer having kept no record.

MARION, MARION COUNTY.

G. W. Blain, health officer.

Population (estimated), 12,000.

Streets, alleys and yards are in a cleanly condition. There is no complaint from lack of sewerage, or improper discharge of sewage. The board has had no trouble in abating nuisances. Night-soil and garbage are hauled about two miles into the country and plowed under.

Contagious diseases are properly reported, and a record is kept. The board has been able to enforce restrictive measures. We have had a great deal of typhoid fever. I could not give the estimated number of persons vaccinated during the year. One thousand eight hundred and thirty-one unvaccinated children are attending school.

We hold a meeting once a month. I could not give the amount of money expended, for we handle none of the funds. We have had no trouble during the year.

MARYSVILLE, UNION COUNTY.

Dr. Graily Henderson, health officer.

Population (estimated), 4,000.

Sanitary condition fair, considering no sewerage.

Board of health has been fairly active, supporting its officers in a fair way in enforcing laws of hygiene. We are trying to make people use empty barrels or boxes with dust, and are meeting with good success in taking care of night-soil.

All contagious diseases are not being reported—whooping cough and typhoid fever; all others are being reported.

Smallpox and whooping cough are the most prevalent.

Number of persons vaccinated estimated at 250.

Twelve meetings held by board of health

Infectious diseases reported during the year: Scarlet fever, 1 case; smallpox, 38 cases; whooping cough, many cases, but none reported.

MASSILLON, STARK COUNTY.

Dr. T. Clarke Miller, health officer.

Population (estimated), 13,000.

Streets, alleys and yards are clean. Sewerage facilities are not within reach of more than one-third of the population. The board abates what it goes for. Night-soil is taken to farms outside. No systematic disposal of garbage.

Contagious diseases are reported. A record is kept. The board enforces its orders without serious trouble. Diphtheria and measles have been more prevalent than usual. Could give no guess as to number of persons vaccinated during the year. It is the rule of the public schools not to admit unvaccinated children, the rule is only enforced in a scattering and popular manner, and I know the superintendent has no basis for an opinion as to the number of unvaccinated pupils. I judge that over half of the children have been vaccinated.

The board of health meets once a month. A quorum is not present at more than half the meetings. The council has expended, on account of the board, about $600 in the past year. A few people have been called upon to "see" the mayor, but no real prosecutions have been had. We generally "get there" by reasoning, coaxing, urging and bluffing. If that should fail we would prosecute.

If men could be selected who would take an interest in the work of the board everything would soon be right. A man who does not know anything about sanitary matters and does not know that he does not know anything will not make a hopeful member of a board of health.

Infectious diseases reported during the year: Diphtheria, 121 cases; scarlet fever, 7 cases; typhoid fever, 17 cases; measles 101 cases.

McCOMB, HANCOCK COUNTY.

J. A. Howell, M. D., health officer.

Population (estimated), 1,500.

The streets and alleys of our village are in almost perfect condition. The only complaint brought to board was for abatement of a slaughter house within the corporation, but that is kept in good sanitary condition now. We served notices on every property owner to clean privy vaults; the order was fully obeyed.

The night-soil is dumped about a mile from village, and properly buried.

Have had no contagious diseases the past year to be reported. A record of contagious diseases is kept.

There have been no vaccinations in village the past year; not to exceed fifty in McComb schools who are not properly vaccinated.

The board of health has held eight meetings during the year.

About seventy-five dollars ($75) have been spent the past year by the board.

No prosecutions for any violations during the past year. Have no suggestions to offer, for the conditions are as good as they can possibly be made.

McCONNELSVILLE, MORGAN COUNTY.

Edgar Sharp, health officer.

Population (estimated), 2,000.

Streets and alleys have been kept in good condition by hauling off objectionable material as fast as it accumulated.

We have no water works, so, of course, no sewers.

All complaints to the health officer have been promptly looked after.

Board of health has a rule to meet monthly, but I think has held but five meetings since March last.

Infectious diseases reported during the year: Typhoid fever, 5 cases; whooping cough, 50 cases; measles, 1 case.

MECHANICSBURG, CHAMPAIGN COUNTY.

W. H Feurt, health officer.

Population (estimated), 2,500.

Our board has maintained an active organization and been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances.

Streets, alleys and yards are kept in a cleanly condition. No cause for complaint from lack of sewerage or drainage. No nuisances that have been deemed necessary to abate, except one slaughter house within the city limits. That was accomplished by mutual agreement between health officer, acting for board of health, and the parties using said slaughter house.

Contagious diseases are properly reported and a record kept. No trouble to enforce restrictive measures. Estimated number vaccinated during year is 200.

Infectious diseases reported during the year: Diphtheria, 1 case.

MAUMEE, LUCAS COUNTY.

M. Dohr, health officer.

The character of nuisances abated by the board is manure piles, privy vaults, etc.

Physicians have not generally failed to report contagious diseases. Five cases of contagious diseases were quarantined by the board.

The board met thirteen times during the year. The amount spent is $320.

MELROSE, PAULDING COUNTY.

Thomas F. Meyers, health officer.

Population (estimated), 450.

Our village is in good condition at present time. We have met once every month during the year. Streets and alleys are looked after by me as health officer. The amount expended this year is $750. We have a board of six members. Our school has 115 scholars, and thirty-five of them were vaccinated six years ago.

Infectious diseases reported during the year: Membranous croup, 3 cases; whooping cough, 2 cases.

MENTOR, LAKE COUNTY.

L. H. Luse, M. D, health officer.

Population (estimated), 500.

This has been a very healthy year. Have not had a case of contagious disease reported. Only one nuisance reported, Frank Presby's slaughter house; but by keeping watch of it, he has done the best he could, and promised to do better this year. But two deaths in the village the past year reported to me, and upon the whole have had a very healthy year. Most all of the children were vaccinated about three years ago, and we are doing so all of the time, so I think all are safe.

Have not had many meetings of the board, for there was nothing to do, and as health officer when any complaints were made have gone and talked with the parties and had them attend to it.

MIAMISBURG, MONTGOMERY COUNTY.

Dr. H. Schoenfield, health officer.

Population (estimated), 4,000.

Streets, alleys and yards are in good condition.

No cause for complaint from the lack of sewerage.

Have no trouble in abating nuisances.

Require all garbage and night-soil to be removed outside of town limits.

Contagious diseases are promptly reported. No record kept. Have been very successful in restricting such persons. Have no record of how many have been vaccinated.

Number of meetings held during the year, fourteen.

Amount spent by board, about $300.

Have had no prosecutions.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 2 cases; typhoid fever, 4 cases; whooping cough, 20 cases; measles, 10 cases.

MIDDLEPORT, MEIGS COUNTY.

D. Sisson, M. D., health officer.

Population (estimated), 3,000.

The streets, alleys and yards of the town are in a fairly good and clean condition for a town of this class, and with the street fund greatly overdrawn.

The sewers drain the surface very well, but they empty into the Ohio river the entire length of the town, which is objectionable. The town is largely unfavorably situated, being on low bottom land and subject to frequent overflows, mixing the contents of privy vaults with wells, cisterns and cellars.

Hog pens exist in considerable numbers and are a nuisance the board has been unsuccessful in abating.

There are no arrangements for removing night-soil and garbage. Much of the garbage is gathered by persons owning hogs and fed to them.

Contagious diseases are reported satisfactorily and a record is kept of such diseases.

Measles were the most prevalent of the contagious diseases. Typhoid fever was next in number.

No vaccinating was done, and there are (*estimated*) two hundred children attending school who have never been vaccinated.

The board of health held only two meetings when a quorum was present.

The expense incurred exclusive of salaries of secretary and ,health officer was $9.50

There were no prosecutions for violation of rules of board or health laws.

Infectious diseases reported during the year: Diphtheria, 2 cases; typhoid fever, 10 cases; measles, 24 cases.

MIDDLETOWN, BUTLER COUNTY.

Dr. G. D. Lummis, health officer.

Population (estimated), 10,500.

Streets, alleys and yards are in good condition. There is no complaint from lack of sewerage. The board has not been unsuccessful in the abatement of nuisances. Night-soil is removed by licensed men.

Contagious diseases are properly reported and a record is kept of same. The board has been able to enforce restrictive measures. Measles have been more prevalent than usual. The estimated number of persons vaccinated during the year is 1,000 The number of unvaccinated children attending school does not exceed twenty-five.

Five meetings were held during the year.

The amount spent is $543.55. No suggestions to offer.

MILFORD, CLERMONT AND HAMILTON COUNTIES.

Dr. Frank C. Curry, health officer.

Population (estimated), 2,200.

Sanitary condition good.

Contagious diseases reported promptly. Measles unusually prevalent. Unable to learn number unvaccinated.

Board has met once a month for six months, and twice a month during summer months.

Amount spent by board, $100.

No prosecutions.

No suggestions.

Mayor and council trying (or rather city attorney) to oust board of health with expense and put in its place councilmen without any pay, health officer and clerk to serve for glory.

We will combat above.

Infectious diseases reported during the year: Diphtheria, 2 cases; measles, 48 cases.

MILFORD CENTER, UNION COUNTY.

Joseph Snyder, health officer.

Population (estimated), 1,000.

No report made.

Infectious diseases reported during the year: Scarlet fever, 4 cases; typhoid fever, 1 case; whooping cough, 24 cases; measles, 10 cases.

MILLERSBURG, HOLMES COUNTY.

C. J. Fisher, health officer.

Population (estimated), 2,500.

No report.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 12 cases; scarlet fever, 1 case.

MINERAL RIDGE, TRUMBULL COUNTY.

Thos. Jenkins, health officer.

Population (estimated), 900.

The board of health does not have many meetings, about three or four in the year. I will give you a better record next year.

Infectious diseases reported during the year: Diphtheria, 4 cases; scarlet fever, 5 cases; smallpox, 1 case; whooping cough, 8 cases; measles, 3 cases.

MONTPELIER, WILLIAMS COUNTY.

H. W. Wertz, M. D., health officer.

Population (estimated), 2,200.

No report.

Infectious diseases reported during the year: Scarlet fever 5 cases; typhoid fever, 1 case; measles, 75 cases; other infectious diseases, 3 cases.

MT. VERNON, KNOX COUNTY.

Dr. Harry W. Blair, health officer.

Population (estimated), 7,500.

Our city is in very good sanitary condition. The streets and alleys are kept clean. A sewer system has, during the past year, been added to the east district, about twenty-five miles being put in. The night-soil and garbage is buried or hauled to the country and used as a fertilizer.

The contagious diseases are in nearly all cases promptly reported. A record is kept of all such diseases. Proper measures for restricting the spread of such diseases are strictly enforced.

The board has met about four or five times during the year. Amount spent by the board, $700. We have had no prosecutions.

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 10 cases; typhoid fever, 24 cases; measles, 5 cases; other infectious diseases, 13 cases.

MOUNT WASHINGTON, HAMILTON COUNTY.

Dr. J. W. Dodds, health officer.

Population (estimated), 800.

Streets, alleys and yards are in very good condition. Sewerage is not perfect. No nuisances reported but what have been abated.

Contagious diseases are reported as soon as diagnosis is confirmed. Vaccinated during year, about 25; unvaccinated attending school, 125.

Board meets monthly, quorum not always present.

Expenses of board $75 per year.

Infectious diseases reported during the year: Diphtheria, 2 cases; typhoid fever, 3 cases; whooping cough, 25 cases.

MURRAY CITY, HOCKING COUNTY.

Dr. T. J. Dillinger, health officer.

Population (estimated), 1,050.

The sanitary condition of our village is fairly good. We had a full board of health last spring and organized and abated all the nuisances. Then part of the board moved away. We will appoint a new board in the spring again when the new mayor is elected. Our village has been remarkably healthy the past year.

Streets, alleys and yards are in a fairly clean condition. No reason for complaint on account of sewerage at present. No nuisances the board has failed to abate. We have night-soil and garbage hauled to the dump, or buried in drains, etc.

All contagious diseases have been properly reported. Our secretary kept them while he was here, but after he left I reported all cases direct to you. There has been no failure of necessary preventive measures. We have had no contagious diseases, except measles, for a year. There have been no persons vaccinated the past year. Very few pupils attending school here have ever been vaccinated. In 1893–1894 I sent and got virus purposely to vaccinate all the children and a howl went up, so I let go. The same thing occurred in various places over the State.

The board of health held three meetings during the year. The amount expended was about $25 No prosecutions were required for violation of orders or laws. Considering the condition of mining towns and the difficulty of appointing a board of health permanently in such towns we have done quite well. There is no pay in the business and many kick and say they will not work for nothing. The law cannot make the board of health serve unless they are compensated for their labor. We handle them the best we can. If the members were paid a stated salary for time actually employed our boards of health would be better satisfied, and would take more interest in the business.

Infectious diseases reported during the year: Measles, 50 cases.

NAPOLEON, HENRY COUNTY.

Oscar E. Barnes, health officer.

Population (estimated), 4,000.

Number of meetings held during year with quorum, six.

Number of meetings held during year without quorum, six.

Present sanitary condition of village good.

Board has maintained active organization, and has been successful in enforcing proper measures for prevention of contagious diseases and the abatement of nuisances.

Streets and alleys are in very cleanly condition. No complaint from lack of sewerage.

One complaint of discharge of sewage, which council is preparing to and will remedy.

No nuisance which board has unsuccessfully tried to abate.

All night-soil removed by one man with approved air-tight barrels; removal regulated by ordinance and done under inspection of health officer. All night-soil removed two miles from corporation and buried. Garbage deposited on a dump ground outside corporation and near no residence.

Contagious diseases have been properly reported and a record kept. Measles most prevalent.

Do not know number of persons vaccinated. Five hundred and forty unvaccinated children attending public school.

Board of health spent $275 during year.

No prosecutions for violation of health laws.

No suggestions to offer.

Infectious diseases reported during the year: Scarlet fever, 1 case: typhoid fever, 4 cases; measles, 20 cases.

NAVARRE, STARK COUNTY.

John Bailess, health officer.

Population (estimated), 1,000.

No report.

Infectious diseases reported during the year: Typhoid fever, 4 cases; measles, 1 case.

NELSONVILLE, ATHENS COUNTY.

Dr. C. E. Welch, health officer.

Population (estimated), 6,000.

Our city health board has maintained an active organization, and has held eleven meetings during the past year. They have successfully disposed of all complaints and nuisances, and as a consequence of their vigilance and strict enforcement of the laws our city is in a very good sanitary condition. Our streets, alleys and yards are kept in a reasonably cleanly condition, they being continually inspected by our sanitary policeman. The city sewerage is always kept open and in excellent condition, and there is no cause for complaint on account of an improper discharge of sewage. All night-soil and garbage not removed by sewerage is hauled out of the city.

All contagious diseases are properly reported, and a record of them kept by the clerk of the board, and by the cooperation of physicians the board has been able to enforce necessary restrictive measures. Scarlet fever and measles have been more prevalent than usual.

The estimated number of persons vaccinated during the year is twenty-five, and our superintendent reports about 560 unvaccinated children in our public schools.

The total expense of our city health board for 1898 is $310.

Infectious diseases reported during the year: Diphtheria, 5 cases; scarlet fever, 24 cases; typhoid fever, 32 cases; measles, 253 cases.

NEVADA, WYANDOT COUNTY.

S. S. Barrett, M. D., health officer.

Population (estimated), 1,500.

We have natural drainage and well cleaned streets and alleys. The orders of the health officer have been obeyed without trouble. Nuisances in the way of outhouses, pig pens, etc., have been ordered cleaned at the expense of the property owners and not the renter.

Contagious diseases are promptly and properly reported and quarantined according to law. The board has had no trouble with quarantine measures. Scarlet fever has been the most prevalent. No smallpox and no vaccination.

There has been no vaccination here for several years. Cannot estimate the number not vaccinated.

Infectious diseases reported during the year: Diphtheria, 4 cases; scarlet fever, 35 cases; typhoid fever, 10 cases.

NEWARK, LICKING COUNTY.

Dr. J. P. H. Stedem, health officer.

Population (estimated), 20,000

The board of health has maintained an active organization, and has been successful in enforcing the proper measures for the prevention of contagious and infectious diseases, and has been unusually successful in its measures for the abatement of nuisances.

The streets, alleys and yards are in a fairly cleanly condition. There is cause for complaint of lack of sewerage, and there is complaint against the improper discharge of sewage of one of our main sewers, owing to change in the course of the south fork of Licking river. The attempt made by the city to remedy this has been unsuccessful.

The only nuisances which the board has failed to abate are the slaughter houses, all of which are within corporate limits of the city.

The board has not yet adopted any plan for the removal of night-soil or the disposition of garbage.

All contagious diseases have been properly reported, except whooping cough, and so far as we have been able to learn there have been but few cases, and those not attended by any doctor.

We keep a record of all contagious and infectious diseases reported, in which the name, age, residence, disease, doctor's name reporting, final result and date of report are entered.

The board has been able to enforce all its restrictive measures. There has been a rather limited amount of contagious diseases, though we have had cases of scarlet fever, measles, diphtheria, membranous croup, whooping cough and one case of smallpox.

There have been about 450 successful vaccinations during the year 1898.

There are in the public schools approximately 600 unvaccinated pupils, and in the parochial schools 100.

During 1898 the board held fifteen meetings. The expenses were:

Salary of health officer	$300 00
Salary of sanitary policeman	350 00
Salary of clerk	50 00
Printing bills	46 00
Cartage	24 50
Expenses incident to smallpox up to December 31, 1898	171 50
Total	$942 00

There were no prosecutions for violations of orders of the board of health.

Infectious diseases reported during the year: Diphtheria, 16 cases; membranous croup, 2 cases; scarlet fever, 12 cases; typhoid fever, 18 cases; smallpox, 1 case; whooping cough, 20 cases; measles, 2 cases.

NEW ATHENS, HARRISON COUNTY.

Arthur Dickenson, health officer.

Population (estimated), 500.

The sanitary condition of our village is good at present so far as I can report.

We have no health board here now and in the summer we have trouble with pig pens, otherwise our village is in very good sanitary condition.

I would like to see a good board here for the purpose of quarantining consumptives. I cannot get our people to understand the necessity of quarantining in this disease.

We have no health officer unless I am considered such.

NEW BREMEN, AUGLAIZE COUNTY.

M. S. Ekermeyer, M. D., health officer.

Population (estimated), 1,800.

Streets and alleys are in fair condition.

There was complaint from the lack of sewerage, but the long talked of sewer will now be constructed.

There are no nuisances which the board has tried unsuccessfully to abate.

We have vault cleaners remove when full.

Contagious diseases are properly reported, but no record is kept. Restrictive measures are enforced.

NEW CARLISLE, CLARK COUNTY.

G. A. Billow, D. D. S., health officer.

Population (estimated), 1,000.

Streets and alleys are in a satisfactory condition. There is no cause for complaint from lack of sewerage or improper discharge of sewage. The board has been universally successful in the abatement of nuisances. No arrangements are made for the disposal of night-soil or garbage.

All contagious diseases are properly reported. We do not keep a very good record of contagious diseases, but hope to from now on. The board has been able to enforce restrictive measures. Smallpox has been more prevalent than usual. Six hundred is the estimated number of people vaccinated during the year. All school children have been vaccinated within past six weeks.

The board held ten meetings during the year; $32 have been spent since Aug. 22, 1898. No prosecutions were brought by the board. No suggestions to offer.

NEW CONCORD, MUSKINGUM COUNTY.

John McKinney, health officer.

Population (estimated), 800.

The town in general is in good condition, there being no contagious diseases.

Cannot give number of meetings held. There are only three members of the board of health of late, and we have been following the directions of the council. No deaths the past year.

I have tried to get a full board of health, but cannot get them to serve. Whose place is it to get these vacant places filled? If the mayor, please notify him.

Expenses of last year amounted to $5.

NEW HOLLAND, PICKAWAY COUNTY.

Samuel McGath, health officer.

Population (estimated), 800.

I have the honor as health officer of the village of New Holland, Ohio, of returning to you my report for the year 1898.

In answer to your questions in reference to the sanitary condition of our streets and alleys, would say we aim to keep them in good condition.

All infectious diseases are promptly reported. Your recommendations as to vaccination have not been complied with. Our board has held four meetings during the year. No prosecutions required.

Our board depends on the township trustees for aid in time of quarantine, there being no provisions otherwise.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 5 cases; whooping cough, 22 cases; measles, 35 cases.

NEW LEXINGTON, PERRY COUNTY.

Lawrence Keating, health officer.

Population (estimated), 2,500.

Streets and alleys are in a cleanly condition, and no nuisances reported that have not been removed. Sewerage in good condition.

All contagious diseases are properly reported. No record has ever been kept of contagious diseases. Board has always been able to enforce proper restrictive measures.

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 25 cases; typhoid fever, 4 cases; other infectious diseases, 6 cases.

NEW LONDON, HURON COUNTY.

A. M. Turner, health officer.

Population (estimated), 1,500.

Our village is in good sanitary condition. We have an active board of health, which is very strict in enforcing proper measures for the prevention of contagious diseases, and the abatement of all nuisances that we are aware of.

Sanitary condition of our streets, alleys and yards are good. All night-soil and garbage are taken outside of corporation limits.

To the best of judgment all contagious diseases are properly reported. We have had but a few cases of contagious diseases during the year 1898. I cannot give the estimated number of persons vaccinated during the year. The board of health did not require anyone to be vaccinated.

Our board held twelve meetings during 1898. Total amount spent by board of health during the year was $140.64.

I have no suggestions to offer for improving our present health board.

Infectious diseases reported during the year: Diphtheria, 1 case; scarlet fever, 1 case; typhoid fever, 2 cases.

NEW MATAMORAS, WASHINGTON COUNTY.

Theo. Heddlesten, health officer.

Population (estimated), 850.

Our village is in good sanitary condition.

Infectious diseases reported during the year: Diphtheria, 6 cases; typhoid fever, 6 cases.

NEW PARIS, PREBLE COUNTY.

Louis Dunn, M. D., health officer.

Population (estimated), 1,000.

With two streams extending from east to west, with undulation of the ground, the drainage of our town is as near perfect as nature could devise. We have a cannery in the corporate limits, and the waste from a half million cans of tomatoes and corn was spread over a lot several acres in extent, except some of the cobs, which were burned, and some other material carted away. This refuse made a very considerable stench, especially noticeable during damp weather. Health officer suggested to managers that they, next season, use a press and after pressing greater part of water from refuse, use the solids remaining as fuel.

Night-soil deposited in open ground vaults. Garbage fed to hogs, or dumped on refuse heaps on each person's premises. Contagious diseases reported and properly isolated. One case of smallpox. About 100 vaccinations. Probably fifty school children not vaccinated. No trouble to enforce orders from health board.

Our board of health is composed of members of council. The health board meets after council meeting adjourns.

This is the only way we have ever been able to secure regular meetings. Had eighteen meetings in 1898, expenses about $15. No prosecutions.

Infectious diseases reported during the year: Smallpox, 1 case.

NEW PHILADELPHIA, TUSCARAWAS COUNTY.

Geo. H Peck, M. D., health officer.

Population (estimated), 6,000.

Streets, alleys and yards in a fair condition. More sewerage is needed, but all nuisances have been successfully abated. The night-soil is removed by the scavenger.

Contagious diseases are properly reported and enforced. Diphtheria has been the most prevalent.

One thousand, two hundred is the total enrollment in the public school, 540 not vaccinated.

Infectious diseases reported during the year: Diphtheria, 7 cases; membranous croup, 2 cases; scarlet fever, 1 case; typhoid fever, 3 cases; other infectious diseases, 7 cases.

NEW RICHMOND, CLERMONT COUNTY.

J. A. Windsor, M. D., health officer.

Population (estimated), 3,000.

No report.

Infectious diseases reported during the year: Typhoid fever, 8 cases; whooping cough, 200 cases; measles, 112 cases.

NEW RIEGEL, SENECA COUNTY.

Peter Trausch, health officer.

Population (estimated), 300.

The board of health of this village was organized last June and is composed of Mathias Altweis, Frank Miller and Martin Hahn, with Peter Trausch, health officer.

This village has no sewer system.

One complaint was made from lack of sewerage, and the nuisance was abated.

No special rules in force for removal or disposition of night-soil and garbage.

Received report of but one case of contagious disease. Have no prevalence of such diseases. There were but four school children vaccinated.

Have had no occasion requiring the expenditure of cash by the board.

Infectious diseases reported during the year: Typhoid fever, 1 case.

NEW STRAITSVILLE, PERRY COUNTY.

Thomas Taylor, health officer.

Population (estimated), 3,000.

I here present the yearly report for the year of 1898, but the report is not very satisfactory to the board or myself, as proper records have not been filed.

The sanitary condition is just moderately good. Streets and alleys are in very good shape and kept moderately clean but should be better.

Sewerage is some better than it was in this village. The board of health has been successful in having all nuisances removed. No arrangements are made for the removal of night-soil. Garden houses are used. The street commissioner removes garbage when authorized by the health officer or the board of health.

Contagious diseases are not properly reported by our physicians, some trying to shield their patients.

Contagious diseases have not been very prevalent in this village. Only one case of scarlet fever has been reported to health board, and two cases of chicken-pox. So our village has not had very much trouble with contagious diseases.

The board of health has held five or six meetings during the year, and have not spent more than $2 during the year outside of paying the health officer, who is paid $5 per month.

Vaccinated children in public school, 222; number of children unvaccinated, 290; parochial school unvaccinated children, 92; vaccinated twelve years ago, 1; vaccinated five years ago, 32; vaccinated four years ago, 20.

I think the health board could be improved by allowing each member a small salary, and then when they fail to meet promptly at the regular monthly meeting there should be a fine for neglect. Then I think the members would take more interest in all matters pertaining to the sanitary condition of their respective localities.

NEWTON FALLS, TRUMBULL COUNTY.

A. C. Lawton, health officer.

Population (estimated), 850.

The present sanitary condition is not the best.

The board held no meetings during the year.

Night-soil and garbage are removed between the hours of 9 P. M. and 6 A. M., and buried in the garbage field owned by the city. Out of an enrollment of 214, 116 have not been vaccinated.

NEW VIENNA, CLINTON COUNTY.

Dr. George R. Conard, health officer.

Population (estimated), 800.

The sanitary condition of the village has been excellent. The health board has maintained its organization, but very little work has been required.

No contagious diseases have prevailed, except measles, and that being in mild form, and first introduced in the school, no effort was made to prevent contagion.

Streets and alleys are cleaned by street commissioner, and there is no sewerage, except by open ditches, which are cleaned under direction of the board.

Meetings have been held only on call, and no prosecutions have been made. The complication in the business of abating any nuisance on account of the board of health being dependent upon council for the allowance of bills, would suggest to me the propriety of the council having full control of the whole matter, to act as a board of health.

Infectious diseases reported during the year: Scarlet fever, 1 case; measles, numerous cases, no deaths.

NEW WASHINGTON, CRAWFORD COUNTY.

George B. Wolf, health officer.

Population (estimated), 1,000.

Sanitary condition fair.

Contagious diseases are properly reported.

The board of health held no meetings, about all that has been done was done by myself.

NEY, DEFIANCE COUNTY.

Dr. P. M. Lehman, health officer.

Population (estimated), 450.

There has been no severe outbreak of any disease; some mild cases of measles, no deaths; some typhoid, no deaths. The township is in fairly good sanitary condition.

This board is now acting under the trustees There was a board organized in the village, but they failed to meet, and dissolved. Very few, if any, children are vaccinated.

Infectious diseases reported during the year: Typhoid fever, 2 cases; measles, 3 cases.

NILES, TRUMBULL COUNTY.

Dr. C. C. Williams, health officer.

Population (estimated), 8,000.

The sanitary condition of Niles for the past year has been very satisfactory, considering the size of the city, its population, and the fact that we have no sewerage at present. Our streets, alleys and yards are kept in a fairly good condition, so far as cleanliness is concerned. Nuisances are successfully abated without prosecutions. There have been no prosecutions for violation of the health laws during the past year. Night-soil is carried out of the city limits to a dumping ground which is not a nuisance to anyone.

Contagious diseases are promptly reported and carefully guarded. During the past year about six persons were vaccinated.

The board of health has met seven times during the year just ended. The expenses of the board, including salaries, for the year were $431.62.

Infectious diseases reported during the year: Diphtheria, 10 cases; scarlet fever, 20 cases; typhoid fever, 35 cases; whooping cough, 100 cases; measles, 40 cases.

NORTH AMHERST, LORAIN COUNTY.

N. H. Cornwell, M. D., health officer.

Population (estimated), 1,800.

The sanitary condition of village is good. The board has maintained an active organization and been successful in enforcing proper measures.

The streets and alleys are cleanly.

Contagious diseases are reported.

The total amount spent during year by health officer was $50; sanitary police, $20, or thereabouts.

There have been but few children vaccinated.

Infectious diseases reported during the year: Diphtheria, 9 cases; membranous croup, 2 cases; scarlet fever, 3 cases; typhoid fever, 3 cases.

NORTH BALTIMORE, WOOD COUNTY.

Dr. J. W. Stoner, health officer.

Population (estimated), 3,200.

Streets, alleys and yards are in fairly good condition. Our sewers discharge into a creek which is usually dry for a month or more each summer, but being on the east side of town, and only two dwellings near their outlets, there has been little complaint. One of them empties into the old bed of the creek about ten rods from the present stream. The board two years ago recommended its extension, but council has ignored the recommendation.

Only a small part of the night-soil is discharged through the sewers, the greater portion being hauled out of town and buried.

Contagious diseases have not been reported as fully as should have been done, and restrictive measures are not very kindly taken. Notwithstanding the presence of smallpox within six miles of town (at Bays) and the offer of free vaccination, I had but one application for vaccination, and believe that was the only one in town. Probably 90 per cent. of our 700 or 800 school children are unvaccinated.

Our board held twelve meetings during the year and expended $191.61.

No prosecutions were brought.

Infectious diseases reported during the year: Diphtheria, 1 case; scarlet fever, 3 cases; typhoid fever, 6 cases.

NORTH LEWISBURG, CHAMPAIGN COUNTY.

A. Spain, health officer.

Population (estimated), 1,000.

The sanitary condition of our village is fairly good. Our board has been in good working order all the time, and has been successful in enforcing all proper measures. The streets and alleys are mostly in a cleanly condition. We have no sewers, and there are no nuisances which the board has tried to abate and failed. Persons are required to remove night-soil and garbage and bury it as directed by the board.

Contagious diseases are properly reported, and a record of such diseases is kept.

The board has been able to enforce proper restrictive measures. Scarlet fever has been more prevalent than usual. Number of persons vaccinated during the year about 10; the number of unvaccinated children attending school is about 55.

The board has held seven meetings during the year, and has spent $22. There have been no prosecutions by the board during the year.

I have no suggestions to offer at present.

Infectious diseases reported during the year: Scarlet fever, 11 cases; typhoid fever, 13 cases; measles, 3 cases.

NORWALK, HURON COUNTY.

Dr. E. Martin, health officer.

Population (estimated), 7,000.

The sanitary condition is good. The board has maintained an active organization, and has been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances.

The streets, alleys and yards are in good condition. There is no complaint from the lack of sewerage or from an improper discharge of sewage. There are no nuisances which the board has unsuccessfully tried to abate. Night-soil and garbage are hauled away.

Contagious diseases properly reported and record kept. The board has been able to enforce proper restriction.

We have had no contagious diseases. None vaccinated during the year.

The amount spent, $325. No prosecution brought by the board.

Infectious diseases reported during the year: Diphtheria, 2 cases.

NORWOOD, HAMILTON COUNTY.

J. C. Cadwallader, M. D., health officer.

Population (estimated), 8,000.

The sanitary condition of our suburb is good; have no alleys, and the streets are in a good sanitary condition.

Garbage is removed by private individuals. The board is endeavoring to have same placed in the hands of the village.

More measles last spring than other contagious diseases. Cases are fairly well reported and measures for prevention of the spread of same are good. About 500 children were vaccinated last year. A very few attend school who have not been vaccinated. The board made it compulsory to be vaccinated in November, 1898, and only those were excused who were ill.

Twelve meetings; expenditures, $1,000. No prosecutions except by the plumbing inspector, which was for violation of village and state ordinance.

Infectious diseases reported during the year: Diphtheria, 23 cases; scarlet fever, 7 cases; typhoid fever, 15 cases; whooping cough, 30 cases; measles, 105 cases.

OAK HARBOR, OTTAWA COUNTY.

F. S. Heller, health officer.

Population (estimated), 2,000.

No report.

Infectious diseases reported during the year: Scarlet fever, 8 cases; typhoid fever, 4 cases; measles, 2 cases.

OAKWOOD, PAULDING COUNTY.

W. E. Osborn, health officer.

Population (estimated), 500.

The present sanitary condition of our village is good.

Our board has not been in active organization the full year past, as three of our board moved from our village late last summer and fall, but it has been reorganized and is in good order now.

Streets and alleys are in fair condition. Night-soil is to be removed in the night.

Number of meetings held in the past year not more than two.

Nothing expended by the board past year. Prosecutions, one for keeping horse meat and hog meat hanging in shed for feeding dogs.

Infectious diseases reported during the year: Measles, 1 case.

OBERLIN, LORAIN COUNTY.

E. L. Burge, health officer.

Population (estimated), 4,700.

No report.

Infectious diseases reported during the year: Scarlet fever, 2 cases; typhoid fever, 11 cases; smallpox, 1 case; measles, 9 cases.

OHIO CITY, VAN WERT COUNTY.

E. B. Grunden, health officer.

Population (estimated), 900.

Streets, alleys and yards in good condition. Sewerage bad. Our system of sewerage is ten-inch tile. No very good outlet. Night-soil taken out and buried on lot of owner of privy; garbage carted off, manure hauled to lots and country. No cases of nuisance but what has been abated. I believe all contagious diseases are reported. The board has been able to restrict infectious diseases. Do not think there has been anyone vaccinated during the year; number of unvaccinated attending school 125. The board of health meet twice a month. Amount spent by health board $30. Have had no prosecutions for violations of health laws.

Infectious diseases reported during the year: Scarlet fever, 2 cases: measles, 6 cases.

OLMSTED FALLS, CUYAHOGA COUNTY.

W. B. Locke, health officer.

Population (estimated), 500.

The sanitary condition of our village is excellent. Contagious diseases are reported, but no record of same is kept. The board has been able to enforce restrictive measures. Measles have been most prevalent, but no deaths reported. In measles we do not quarantine. What is your opinion as to whether they should be?

Infectious diseases reported during the year: Typhoid fever, 1 case.

ORRVILLE, WAYNE COUNTY.

Dr. A. A. Brooks, health officer.

Population (estimated), 2,000.

Streets and alleys are in good condition, considering that we have little or no sewerage. Have no trouble in abating nuisances. The board is embarrassed by no means being made for disposal of garbage and night-soil. Contagious diseases are reported and a record kept of same. The board enforces proper restrictions. We have had more cases of typhoid fever than usual. There have been a good many pupils vaccinated recently but still a good many unvaccinated; impossible to state how many.

The board has held eight regular meetings in last year. One hundred and eleven dollars and twenty cents is amount board has spent in last year. There have been no prosecutions brought by the board. I think State Board is doing all it can, and have no suggestions to make.

In my report to our city council I advised the public to abandon wells and use city water, as all of our cases of typhoid fever were in families using well water; also suggested that some provision be made for disposal of garbage and night-soil.

Infectious diseases reported during the year: Scarlet fever, 5 cases; typhoid fever, 11 cases.

OSNABURG, STARK COUNTY.

W. D. Davis, M. D., health officer

Population (estimated), 600.

No report.

Infectious diseases reported during the year: Diphtheria, 12 cases; membranous croup, 3 cases; scarlet fever, 8 cases; typhoid fever, 2 cases.

OTTAWA, PUTNAM COUNTY.

Frank Light, health officer.

Population (estimated), 2,500.

No report.

Infectious diseases reported during the year: Whooping cough, 15 cases; measles, 6 cases.

OTWAY, SCIOTO COUNTY.

Alfred Jones, health officer.

Population (estimated), 350.

Sanitary condition of the village fair.

Had the sewerage put in good condition last summer.

No arrangement made as yet for the removal of night-soil and garbage.

It has been quite healthy here, no contagious diseases in the past year whatever.

Cannot ascertain the number of persons vaccinated during the year.

Board of health organized May 10, 1898, held two meetings and spent $8.

Have no suggestions to offer.

OXFORD, BUTLER COUNTY.

John T. Preston, health officer.

Population (estimated), 2,500.

No report to make as the board has only been organized a few weeks.

PAINESVILLE, LAKE COUNTY.

George M. Cranston, health officer.

Population (estimated), 8,900.

C. C. Finneran, Chas. A. Jepson, Chas. T. Radcliffe, Dr. C F. House, John Malin, Samuel T. Woodman, members of Painesville board of health.

Streets, alleys and yards are in a very cleanly condition. No cause for complaint from lack of sewerage or from improper discharge of sewage. No nuisances which the board has unsuccessfully tried to abate

Night-soil is removed out of corporation to plat of ground rented by board of health for the purpose and plowed under. Work done by man under contract with board of of health. Collects his pay from parties for whom he does work, at schedule of prices arranged by board.

Garbage is removed to dump ground out of city and disposed of by man in charge of grounds.

All contagious diseases are properly reported, record of such diseases being kept by board of health. The board has been able to enforce proper restrictive measures without trouble.

Measles were more prevalent last spring than any other contagious disease, though nearly all cases were very light.

In January, 1894, the Painesville board of health passed an order that no child should be admitted to any school in village without presenting satisfactory evidence of having been successfully vaccinated or having had smallpox. This order was very generally complied with. Last month (December, 1898,) the board called the attention of the public to this order through the press and we believe it is receiving general attention now.

The board held nine meetings during the year. Other meetings were called, no quorum being present, no business done.

The expenses of board for the year were $339.83. Health officer, salary, $180; clerk, $60; sanitary officer, $60; rent of night-soil dump ground, $10; rent of garbage dump ground, $25; printing, $4.33; burying dead body, 50 cents.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 1 case; scarlet fever, 2 cases; typhoid fever, 2 cases; measles, all very mild, 30 cases.

PATTERSON, HARDIN COUNTY.

Peter Breidenbach, health officer.

Population (estimated), 300.

Streets, alleys and yards are in good condition. There is no cause for complaint of any kind. There are no nuisances of any kind.

Night-soil and garbage are buried at a proper depth.

There have been no contagious diseases here in the last ten years. The board has enforced all measures so far. There were none vaccinated during the year 1898.

The board of health has held two meetings. There have been no prosecutions.

PAYNE, PAULDING COUNTY.

J. E. Mulligan, M. D., health officer.

Population (estimated), 1,500.

No report.

Infectious diseases reported during the year: Diphtheria, 20 cases; membranous croup, 4 cases; typhoid fever, 5 cases; whooping cough, 6 cases; measles, 50 cases.

PEEBLES, ADAMS COUNTY.

O. W. Robe, M. D., health officer.

Population (estimated), 1,000.

I cannot give you a report as you ask. The present board of health has had two meetings in the last year. The expenses for the year have been about $6.

No record is kept of deaths or contagious diseases. Our village is very poorly drained.

Typhoid fever is our worst disease. About six or seven cases in town last summer.

I wish to learn the duties of board of health and insist on their enforcement.

PEMBERVILLE, WOOD COUNTY.

Henry E. Long, health officer.

Population (estimated), 1,500.

Streets, alleys and some yards are in a very muddy and unhealthy condition. The board has not tried to abate any nuisances. As for night-soil and garbage, I have to dispose of it wherever I can get a farmer to let me in on a back field.

Contagious diseases: There were a number of typhoid fever cases, but they were not reported. Parochial school enrollment, 50; unvaccinated, 49; vaccinated, 1. Public school enrollment, 280; vaccinated, 50.

Board of health held one meeting. They have spent nothing, not even a barrel of lime, and they will not do anything. Last summer the water stood in the gutters six or eight inches deep and full of maggots. I went to the council and they told me it was none of my business.

There is only one doctor reports contagious diseases. The township clerk has sent in the rest. I would have sent in my report before this, but my family and myself have been sick.

Infectious diseases reported during the year: Diphtheria, 7 cases; membranous croup, 2 cases; scarlet fever, 9 cases; typhoid fever, 39 cases; whooping cough, 20 cases.

PERRYSBURG, WOOD COUNTY.

Dr. J. H. Rheinfrank, health officer.

Population (estimated), 2,000.

During the year 1898 the board of health did nothing whatever. The board of health has maintained no organization for the past year, did not have a meeting during the year, and no means were taken for the prevention of contagious diseases, but fortunately we had none to contend with.

The streets and alleys are not in a cleanly condition, and there is great cause for complaint from the lack of sewerage. To sum the whole matter up our council will do nothing for us. Our total expense for the year 1897 was the enormous sum of $2.50, and we had to fight with the council for three or four months before we could get it allowed, and we had actually commenced suit before they allowed it. We have therefore all lost heart in the cause and there will be nothing done this year, unless there can be a change made in the council at the spring election.

We are unable to pay the expenses out of our own pocket, and we are therefore obliged to struggle along and take our chances with the rest.

In our opinion there should be a law passed *compelling* councils to levy a tax expressly for the use of boards of health, and turn it over to the treasurers of said boards, so that there could be no other use made of it.

We have a very healthy village, but it can be greatly improved sanitarily.

The board of health is ready and willing to do all in its power to improve the condition of the town, but we have not the means to do *anything* with.

Infectious diseases reported during the year: Typhoid fever, 2 cases.

PIQUA, MIAMI COUNTY.

Dr. F. E. Kitzmiller, health officer.

Population (estimated), 12,000.

No report.

Infectious diseases reported during the year: Diphtheria, 76 cases; membranous croup, 2 cases; scarlet fever, 20 cases; typhoid fever, 19 cases.

PLAIN CITY, MADISON COUNTY.

Dr. J. S. Howland, health officer.

Population (estimated), 2,000.

Good sanitary condition. Organization of the health board maintained and all the rules enforced.

We have a dumping ground a mile from town, which is in charge of the scavenger. Night-soil and garbage buried in trenches.

Nothing reported to me as contagious this year. We have had some whooping cough in the village, which had no physician. No vaccination order, and no report kept.

We should have a system of sewerage.

PLAINFIELD, COSHOCTON COUNTY.

J. D. Parker, health officer.

Population (estimated), 375.

The reason this blank was not filled out before this is, Mr. Jenkins has been gone from our village for two years, and the last report I made—the papers sent to Mr. Jenkins—was not delivered to me until last week.

Infectious diseases reported during the year: Diphtheria, 6 cases; scarlet fever, 10 cases; typhoid fever, 2 cases; measles, 2 cases.

PLEASANT HILL, MIAMI COUNTY.

A. J. Bausman, health officer.

Population (estimated), 700.

There were five meetings of the local board of health. They enforced their authority carefully, and reaped good results.

The sanitary condition is good. All contagious diseases have been properly reported.

The expenses of the board of health for 1898 were $22.25.

PLEASANT RIDGE, HAMILTON COUNTY.

C. W. Acomb, health officer.

Population (estimated), 1,250.

Streets and alleys are in good condition.

There is no cause for complaint, from lack of sewerage, or from an improper discharge of sewage.

Owing to our natural location and homes having large lots, we have no general plan of sewerage only for street purposes.

We have met and abated all nuisances.

Night-soil is removed without any smell, a perfectly air-tight wagon being used, with pump and hose attached.

Contagious diseases are properly reported. We keep a complete record to the best of our knowledge.

We have had but two cases of contagious or infectious diseases reported during the year.

Physicians report a general use of vaccine points throughout their practice, among children mostly.

Regular meetings nine. Money expended for use of health board, about $100.

There have been no prosecutions for violation of orders or health laws.

Infectious diseases reported during the year: Scarlet fever, 2 cases.

PLEASANTVILLE, FAIRFIELD COUNTY.

Dr. W. E. Baker, health officer.

Population (estimated), 600.

Streets, alleys, etc., are in fair condition. There is cause for complaint from lack of drainage. There are no nuisances which the board has unsuccessfully tried to abate. No arrangements are made for the disposal of night-soil and garbage.

Contagious diseases are not properly reported by other physicians. Scarlet fever, measles and whooping cough have been more prevalent than usual. There has been no vaccination during the year. The board held three meetings during the year. Amount of money expended is $6.25. No prosecutions were brought by the board. No suggestions to offer.

I can only make a partial report of deaths, births, etc., owing to other physicians failing to report their cases.

Number of births reported, eight.

The sanitary condition of our town is fair. Our board is not active in its organization.

POLAND, MAHONING COUNTY.

C. R. Justice, health officer.

Population (estimated), 600.

The sanitary condition of village of Poland is good. We have good natural drainage. Our organization is not good; several of the members have died or moved away, and the council take but little interest in the board of health's welfare; yet we have not had any epidemic. Each property owner removes the night-soil from his own premises. Contagious diseases are properly reported and record kept. The board has had two meetings in past year.

Infectious diseases reported during the year: Scarlet fever, 4 cases; typhoid fever, 1 case; whooping cough, 12 cases.

POLK, ASHLAND COUNTY.

W. H. Reinhart, M. D., health officer.

Population (estimated), 250.

Our village is in good sanitary condition. Its rolling site admits of good drainage and having a clay subsoil, percolation of noxious substances into wells is not favored.

Most drinking water is obtained from cisterns.

Our ordinances provide for privies at a safe distance from wells or cisterns, with drawer or no vault, the night-soil from them to be kept well limed, and to be removed and buried in the months of March and October.

The proper drainage of our cellars is the greatest trouble we have to contend with.

Our people generally comply with the board's requirements cheerfully.

Contagious diseases are properly quarantined, reported and recorded. We are remarkably free as a rule from them. This year is the first that scarlet fever has been among us for 20 years or more. Have had no diphtheria, except a couple transient cases, for many years. Typhoid but seldom. Chicken-pox and whooping cough were among us during the summer and fall and worked on about all the liable children. The one death from scarlatina reported herewith was contracted in Mansfield in the spring and was limited to the one case. Two cases are now convalescing, and came to us by visitors from Orange township, our neighbors on the west, where, in Nankin, they have had 16 or 18 cases. It is of a very mild nature. One other case is in the township outside the corporation.

In our schools 70 pupils are enrolled, 59 of whom cannot show a good vaccination mark.

Board has had four meetings. They agreed to give me $5 for my services as health officer. No other expenses in the year.

No prosecutions in the year; but a couple complaints of nuisances have been made.

No improvement in boards or methods to suggest.

Infectious diseases reported during the year: Scarlet fever, 3 cases. These cases not reported: Whooping cough, probably 20 cases; chicken-pox, probably 30 cases.

PORTAGE, WOOD COUNTY.

Joseph Close, health officer.

Population (estimated), 600.

In answer to your first question I wish to say that our streets, alleys, etc., are in as cleanly a condition as is usually found at this time of the year, but not quite as cleanly as we would like to have them. We have a good fall for our sewer, and have no complaint from same.

We have had some trouble getting boxes put in our privies, and have only partially succeeded thus far.

Our night-soil and garbage is taken away to a dump ground that we have outside the corporation limits.

I believe contagious diseases are properly reported and a record kept.

I believe we have had no trouble in using restrictive measures in regard to contagious diseases.

We have been very free the past year as to contagious diseases.

Number vaccinated during the year, 4.

There are about 100 unvaccinated children in the schools of the village or town of Portage.

Number of meetings of the board during the year, nine. Amount spent by the board for the year, 12.50.

Infectious diseases reported during the year: Scarlet fever, 1 case; measles, 4 cases.

PORT CLINTON, OTTAWA COUNTY.

Dr. Paul de la Barre, health officer.

Population (estimated), 3,000.

Streets, alleys and yards are in cleanly condition. All nuisances are successfully abated except hog pens, and these will go this year.

For disposition of night-soil and garbage a dump ground has been arranged for this year.

Contagious diseases are properly reported. The health officer keeps records of contagious diseases.

The board was able to enforce proper restrictive measures.

Diphtheria was prevalent during January, carried over from year before.

No vaccination.

There are 528 enrolled children in school and 297 not protected by vaccination.

The board had about sixteen meetings. Amount spent by board about $200.

No prosecutions.

Infectious diseases reported during the year: Diphtheria, 7 cases; typhoid fever, 2 cases.

PORTSMOUTH, SCIOTO COUNTY.

Dr. Joseph Swander, health officer.

Population (estimated), 18,000.

In reply to your first query, will say that our city is in fair sanitary condition, and the board of health has been active and successful in prevention of contagious diseases and in the abatement of nuisances. The streets and alleys are fairly clean, and city council has just authorized the construction of a new piece of sewer and the grading and paving of about a mile on Gallia street, one of the principal thoroughfares.

The usual contagious and infectious diseases have been kept well in hand and have been few in number, with few deaths. Have no means of telling the number of children vaccinated during the past year, but will endeavor to learn through the superintendent of public schools. The night-soil is placed in trenches three feet deep, outside of corporation and covered with not less than twenty inches of absorbent soil. The garbage is removed by and at the expense of city, under charge of the street commissioner. The board held thirteen regular meetings during the year. The running expenses for the twelve months ending December 3, 1898, are as follows: Salaries of officials, $1,047.50; repairs, postage and sundry, $89.05; prescriptions for poor, $139.71; total, $1,276.26.

Only were two prosecutions during the year for violations of health rules, and both were dismissed upon agreement to make necessary abatements. Have no suggestions to make.

NUISANCES ABATED IN 1898.

Foul vaults, 33; full vaults, 32...	65
Foul cellar and yard drains..	27
Filthy yards and lots	53
Filthy hog pens and stables	66
Stagnant ponds	15
Foul cellars	23
Foul alleys, 10; foul gutters, 12..	22
Dead animals: Horses, 37; cows, 25; calves, 2; hog, 1....	65
Total nuisances abated	336

Infectious diseases reported during the year: Diphtheria, 52 cases; membranous croup, 1 case; scarlet fever, 17 cases.

PORT WASHINGTON, TUSCARAWAS COUNTY.

N. W. Nargney, health officer.

Population (estimated), 600.

Our streets, alleys and yards are in a very good condition. No complaint in regards to sewerage. The only nuisance which we were unsuccessful in abating was during the flood last spring. The water overflowed the town, the western part being very low the water remained for over a month and became stagnant. We required the help of the township board and reported to that board but failed to receive any help and finally gave it up. The same part of the village is still in a bad condition as there is always water standing for several days after a rain.

There is no arrangement for the disposition of night-soil.

No contagious diseases have been reported. There has been none to report, to our knowledge. Eighty unvaccinated children in our schools.

The board has had an active organization since April and has held seven meetings.

PORT WILLIAM, CLINTON COUNTY.

S. L. Thorp, health officer.

Population (estimated), 288.

We have no organization of a board of health only by order of council. If there are any laws for the health officer to have, I would like to have one so I could read up on it.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 2 cases; whooping cough, 12 cases.

POWHATAN POINT, BELMONT COUNTY.

Franz Saner, health officer.

Population (estimated), 600.

Sanitary conditions good. No contagious diseases. I know of no vaccinations, our school children were all vaccinated three or four years ago.

Board of health met twice, no expense incurred. No prosecutions.

Infectious diseases reported during the year: Typhoid fever, 3 cases.

PUT-IN-BAY, OTTAWA COUNTY.

Hugo Steiert, health officer.

Population (estimated), 300.

Sanitary conditions are good. Night-soil is hauled outside of village limits and buried. The contagious diseases are properly reported.

The board does not meet very often. I think they should meet at least once a month.

Infectious diseases reported during the year: Typhoid fever, 1 case.

RAVENNA, PORTAGE COUNTY.

Lee W. Wood, health officer.

Population (estimated), 4,000.

All streets and alleys are in a fair sanitary condition. The great need of this town is a system of sanitary sewerage, of which we have not a foot. So far we have been very successful in abating all nuisances. All night-soil is removed in wagons in sealed barrels. Physicians have been very prompt in reporting all contagious diseases, but no record of diseases kept. Do not know the number of children vaccinated during the year, but of an enrollment of 765 there are 307 not vaccinated.

Our board of health meets once a month. Amount of expenditures during the year, $331.

Infectious diseases reported during the year: Scarlet fever, 5 cases; typhoid fever, 1 case.

RAWSON, HANCOCK COUNTY.

Mike Smith Jr., health officer.

Population (estimated), 450.

Streets, alleys and yards are in a fair condition. Sewerage is not of the best. Night-soil and garbage are hauled out of corporation.

Contagious diseases are promptly reported. Scarlet fever is more prevalent than usual. Probably 100 people vaccinated.

About 15 meetings held, total amount spent, $10.

I have no suggestions to make at present as business here is very limited.

Infectious diseases reported during the year: Scarlet fever, 3 cases; typhoid fever, 20 cases.

READING, HAMILTON COUNTY.

Riley Murphy, health officer.

Population (estimated), 3 500.

All streets, alleys and yards of the village in fair sanitary condition. Rules of local board require health officer to report on this matter every month. No complaint of sewerage. All nuisances brought to the attention of this board were successfully abated. All night-soil is removed, under the supervision of the health officer, to a point outside of the village, and remote from any dwelling or water supply. All garbage is also removed to a point outside of the village, and under the supervision of the village council.

All contagious diseases are promptly and properly reported, and a record of the same kept. This board has had no trouble whatever in enforcing the proper restrictive measures. During the year 1898 but two cases of contagious diseases were reported, one of diphtheria and one of scarlet fever. Very little attention has been paid to the matter of vaccination. Estimated number vaccinated during the year 1898, 50. Estimated number of children attending public and parochial schools that have been vaccinated, 50 per cent.

This board meets regularly the first Monday in each month. Total expense of the board for the year 1898 was $141.

Officers of the board for the year 1898-99 were:

Daniel Laurence, president.
C. S. Dils, clerk.
Riley Murphy, health officer.

Members of board.—Jos. Grah, John Sharkey, Henry Volle, Adam Koenig, Herman Eiling and Jacob Sponenberger.

No suggestions to offer in regard to improving the form or character of present board.

Infectious diseases reported during the year: Diphtheria, 1 case; scarlet fever, 1 case.

REPUBLIC, SENECA COUNTY.

F. C. Gilcher, M. D., health officer.

Population (estimated), 500.

There are no special rules regarding disposal of night-soil and garbage here, but we advise the dry earth system in each closet. When necessary the night-soil is removed by parties owning closets. Streets, alleys and yards are in a cleanly condition. Most of the water used in the town is cistern water, but there are a few drilled wells used. It is to this fact that we lay claim to having no contagious diseases here.

Contagious diseases are reported, and a record is kept. There were a few cases of chicken-pox last spring, but no record was kept of them then.

The board of health meets on the evening of the first Thursday of each month. We had no prosecutions during the year. The total amount spent by the board of health for the year 1898 was $30.

REYNOLDSBURG, FRANKLIN COUNTY.

F. G. Taylor, M. D., health officer.

The board has not maintained an active organization. No cause of complaint with reference to the condition of streets and alleys. No nuisances but what have been removed.

Contagious diseases are properly reported through Dr. Dysart and myself. Diphtheria has been more prevalent than usual. Two persons vaccinated. About 75 or 80 unvaccinated children.

The health officer was appointed, but never sworn in. Would not be of any value if he was sworn in.

Infectious diseases reported during the year: Diphtheria, 35 cases; typhoid fever, 10 cases.

RIDGEWAY, HARDIN COUNTY.

Dr. E. B. Crow, health officer.

Population (estimated), 500.

The present sanitary condition is good, our board wide awake. Streets and alleys in good condition. Sewerage satisfactory, and no unabated nuisances.

Nearly every one has been vaccinated.

Only three *regular* meetings, but *informal* meetings are frequent. We spent $17 during past year.

We have nuisances removed by the marshal at the expense of the property owners or council, and I cannot tell what it costs or has cost them. No prosecutions.

Have been "wrestling with the grip," or would have reported sooner.

Infectious diseases reported during the year: Membranous croup, 1 case.

ROCHESTER, LORAIN COUNTY.

J. C. Dignan, M. D., health officer.

Population (estimated), 300.

The sanitary condition of our village has been and is now first-class. The board of health has maintained an active organization and has been successful in abating nuisances and holding in check contagious diseases. Streets and alleys are in a cleanly condition. No faulty sewerage. The board has been successful in abating all nusiances peculiar to slovenly and careless tenants and property holders, also in causing to have drained stagnant ponds.

Two contagious diseases have been reported—scarlet fever and diphtheria—which were promptly and successfully quarantined, but as they were out of the corporation I have no record of them. There have been no vaccinations during the past year in the township to my knowledge. Therefore the majority of the pupils are undoubtedly unvaccinated.

The board has regular monthly meetings in summer, but on account of extra work met much more frequent. The principal expense of the board has been postage on notices which I defrayed without any compensation or charge.

No prosecutions for violation of our rules, as they have been complied with in every respect.

Infectious diseases reported during the year: Diphtheria, 7 cases; scarlet fever, 1 case.

ROCKY RIDGE, OTTAWA COUNTY.

Wm. Schlegel, health officer.

Population (estimated), 525.

No report.

Infectious diseases reported during the year: Scarlet fever, 2 cases; measles 1 case.

ROGERS, COLUMBIANA COUNTY.

C. T. McArtor, health officer.

Population (estimated), 500.

The sanitary condition of the village is fairly good, considering the fact that we have no system of sewerage. The board of health maintains an active organization and has been fairly successful in abating nuisances.

The number of notices to abate nuisances issued during the year was 62, applying mostly to privy vaults and were fairly well obeyed.

We have no arrangements, except the rules adopted by the board, for the removal of night-soil and garbage. What would you suggest?

The physicians do not report diseases properly. What should be done in this matter? Typhoid fever most prevalent, but not reported and not coming to the knowledge of the board until after recovery. There has been no one vaccinated.

Board of health meets every month, except when a special meeting becomes necessary. The total amount spent during the past year was $1. The reason why more was not expended was that the council had made no levy for sanitary fund. We have now a levy made for the coming year.

No prosecutions by board.

ROSEVILLE, MUSKINGUM COUNTY.

John H. Wolff, health officer.

Population (estimated), 1,500.

Present sanitary condition of our village is fair.

Our local board of health as a whole has active members, but depend greatly on their health officer.

Streets, alleys and yards are in a fair condition. No cause for complaint for lack of proper discharge of drainage or sewerage.

Night-soil and garbage are usually buried.

Contagious diseases are properly reported, yet no record is kept except what is made by health officer. Diseases which have been more prevalent than usual are measles and typhoid fever.

Out of two hundred and eighty-two scholars in our public schools one hundred and fifty are unvaccinated.

Our local board has had about six meetings during the year 1898.

Money spent by board, including health officer's salary, was about $20.

Infectious diseases reported during the year: Membranous croup, 1 case; typhoid fever, 5 cases; measles, 5 cases.

RUSHVILLE, FAIRFIELD COUNTY.

W. G. Lewis, M. D., health officer.

Population (estimated), 300.

The present sanitary condition of our village is good. All reported nuisances have been abated without trouble.

Contagious diseases are generally reported promptly, and restrictive measures enforced.

The board of health has had four meetings, and expenditures have been about $20.

Very few persons vaccinated during year. Considerable number of children not vaccinated. No special action in that direction has been taken.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 2 cases.

SABINA, CLINTON COUNTY.

J. L. Johnson, health officer.

Population (estimated), 1,700.

Streets, alleys, lots, etc., in fair condition and have been kept in good condition only while laying water mains. There is no complaint from lack of sewerage, but there is from an improper discharge of sewage. The discharge is in the creek and water stands at and below the outlet. No nuisances, except the pools or ponds in the creek. Night-soil is removed in a tight box on a wagon and hauled and scattered on farms adjoining the village.

There has not been a single case of contagious disease reported in the village for two years. About all children of school age have been vaccinated.

The number of meetings held during the year was twelve, and several meetings in addition to the twelve we had no quorum. No prosecutions.

Amount of expense, $50.62.

ST. BERNARD, HAMILTON COUNTY.

S. B. Howard, M. D., health officer.

Population (estimated), 2,850.

The village is in a good sanitary condition.

Contagious diseases are reported promptly, and are given immediate attention.

Infectious diseases reported during the year: Diphtheria, 1 case; typhoid fever, 2 cases; measles, 2 cases; other infectious diseases, 9 cases.

ST. MARYS, AUGLAIZE COUNTY.

B. E. Thomas, M. D., health officer.

Population (estimated), 6,500.

Night-soil and garbage are deposited outside the city limits, usually on farms as fertilizer.

Contagious diseases are reported and rules of State Board of Health are strictly enforced.

The town has no general sewerage system. This fact has been a continual drawback to the local board.

Two thousand five hundred have been vaccinated during the year (estimated).

Board of health held twelve meetings during the year; $1,500 have been spent, $1,407 of which were spent to prevent spread of smallpox.

You will notice the number of deaths from puerperal fever (10) is too high in proportion to the number of deaths. These were brought about in the practice of a single physician.

What is the duty of a board of health in a case of this kind?

Infectious diseases reported during the year: Diphtheria, 3 cases; scarlet fever, 2 cases; typhoid fever, 12 cases; smallpox, 5 cases; whooping cough, 17 cases; measles, 100 cases.

SALEM, COLUMBIANA COUNTY.

Dr. F. T. Miles, health officer.

Population (estimated), 8,000.

Streets and alleys properly cleaned. Urgent need of sewerage. Night-soil removed in water-tight barrels.

Contagious diseases are properly quarantined and record is kept of such. Possibly less than 100 persons vaccinated, and should say that from 300 to 500 school children have never been vaccinated.

Board met twenty times during the year and spent $708.75.

Infectious diseases reported during the year: Diphtheria, 13 cases; scarlet fever, 7 cases; typhoid fever, 17 cases; measles, 29 cases.

SALESVILLE, GUERNSEY COUNTY.

W. E. McKinley, health officer.

Population (estimated), 350.

Streets and alleys in fair condition; room for improvement in sewerage. General condition of village is good. Board has had two meetings. No expenditures in the last year. Whooping cough was only disease present during last year. Cases duly reported. General health has been excellent during past year.

Infectious diseases reported during the year: Typhoid fever, 1 case.

SALINEVILLE, COLUMBIANA COUNTY.

James Carter, health officer.

Population (estimated), 2,500.

No report.

Infectious diseases reported during the year: Diphtheria, 1 case; membranous croup, 1 case; scarlet fever, 10 cases; typhoid fever, 1 case.

SANDUSKY, ERIE COUNTY.

C. Eug. Stroud, M. D., health officer.

Population (estimated), 25,000.

The sanitary condition of city is good, and there is no complaint of lack of sewerage; also sewers are in good condition and are frequently flushed.

Contract is advertised for cleaning privy vaults, and let to lowest responsible bidder, and bond of $1,000 required for faithful observance of rules, etc.

All contagious diseases are properly reported and record kept of same.

Smallpox has been more prevalent than at any time since 1864.

About 75 per cent. of school children have been successfully vaccinated.

Total number of meetings of our board during year ending December 31, 1898, 18. Total expense of board during said year, $2,360.67.

Infectious diseases reported during the year: Diphtheritic croup, 3 cases; diphtheria, 14 cases; membranous croup, 14 cases; scarlet fever, 10 cases; typhoid fever, 20 cases; smallpox, 27 cases; whooping cough, 1 case; measles, 7 cases; chickenpox, 54 cases.

SCOTT, VAN WERT COUNTY.

T. J. Lewellyn, health officer.

Population (estimated), 400.

Streets and alleys kept in fair shape. Sewerage is good. No nuisances. For removal of night-soil, no arrangement. Had no contagious disease. Vaccinated forty. Board of health meetings twelve.

SHREVE, WAYNE COUNTY.

J. D. Barcus, health officer.

Population (estimated), 1,200.

Our streets, alleys and yards are in a cleanly condition. We have no sewerage system. There have been no nuisances which the board has not successfully abated. The night-soil, under best conditions, is removed from vaults each spring.

Contagious diseases are properly reported, a record kept, and proper restrictive measures enforced.

We think there has been no one vaccinated during the past year and would estimate between 160 and 180 unvaccinated children in our schools. We endeavor to meet monthly, and have expended $25 the past year.

Infectious diseases reported during the year: Scarlet fever, 1 case.

SIDNEY, SHELBY COUNTY.

Wm. C. Wyman, health officer.

Population (estimated), 6,000.

The sanitary condition is good, streets and alleys all fairly cleanly. There is some complaint on account of failure to get sewerage. No complaint as to the discharge of what we have. There was no nuisance but that was abated on discovery. Night-soil is taken out in the country. We have a place for garbage for two or three years yet, one and one-quarter miles from town.

Contagious diseases are all properly reported when there is a doctor in the the case. During the year we had a great many cases of measles which were not reported. All were light and no doctor. This gave the board some trouble, as no records were kept of cases, except the cards of the doctors reporting. Will keep a written record this year. Measles was the prevailing disease, all were light. Dipththeria cases also mild. About 30 were vaccinated during the year. It is impossible for the superintendent of schools to give me the number at this time of unvaccinated children attending schools.

Total meetings of the board, eleven. Total expense, $300.76. Have had no prosecutions. I have no suggestions to the Sidney board as they have succeeded this year of 1898, in keeping the city in first-class order, when so many other places were suffering from smallpox, and other contagious diseases.

Fifty-four permits were issued for cleaning privy vaults; one removed; one well closed up, and four permits to remove corpse.

Infectious diseases reported during the year: Diphtheris, 15 cases; scarlet fever, 2 cases; typhoid fever, 4 cases; measles, (must have been 100 cases), 35 cases reported; chicken-pox, 3 cases.

SMITHFIELD, JEFFERSON COUNTY.

W. H. Wood, health officer.

Population (estimated), 600.

Our village is situated on a high ridge, the main street being on top of the ridge and parallel with it. This gives us excellent drainage. The town council acts in the capacity of a board of health in attending to keeping yards, alleys and streets clear of filth and rubbish. All nuisances of any kind when reported are abated by order of council. No dead animals are permitted to lie on lots or in alleys. Each spring a notice is given for a general cleaning up of the alleys, water-closets, etc., by a certain day, usually about May 10, and if not attended to by property holders it is done by the street commissioners and charged to the property. We have but little trouble and the freedom of our village from diseases due to filthy conditions attests the efficiency of our work. We had two mild cases of typhoid fever this fall that seemed to originate in town, the first cases for six years. Two other cases were brought into town with the disease before these occurred. No diphtheria or membranous croup for sixteen years, and only one case of scarlet fever in that time.

No vaccinations during the year.

No expenditures for board of health.

Infectious diseases reported during the the year: Typhoid fever, 4 cases.

SMITHVILLE, WAYNE COUNTY.

D. H. Morgan, M. D., health officer.

Population (estimated), 500.

Streets and alleys are kept clean. The only complaints to the board have been concerning defective drainage in rented houses. The board has been unsuccessful in abating a nuisance at one place—an unused well—and one or two places where slops are emptied. Night-soil is hauled away. As to garbage, nothing done by the board.

Contagious diseases are properly reported when a physician is in attendance. When one is not in attendance, no. A record of contagious diseases is kept. The board has been able to enforce proper restrictive measures. There has been but little or no vaccination. The smallpox scare has not reached us.

The board has met a number of times, I do not know the exact number. Nothing spent except for correspondenee and a few incidentals. No prosecutions have been brought by the board. I have no suggestions to offer for improving the form or character of our present health boards.

SOMERSET, PERRY COUNTY.

Frank Sutton, health officer.

Population (estimated), 1,500.

One meeting of the health board last year. We have no infectious diseases at present.

Infectious diseases reported during the year: Diphtheria, 17 cases; membranous croup, 4 cases; scarlet fever, 6 cases.

SOUTH BLOOMFIELD, PICKAWAY COUNTY.

Chas. E. Blacker, M. D., health officer.

Population (estimated), 250.

The natural drainage and subsoil of this village is not supassed for healthfulness by any spot on earth; so that though a few manure piles get into the alleys occasionally, and there be some dozen or more of the citizens who keep hogs within the corporate limits, yet it is a verity that the sanitary condition of the town is quite fairly good.

The council was seized with a desire to assume metropolitan airs and spent some $200 in cutting down the principal street and its sidewalks, thereby considerably spoiling the dryness of the street and sidewalk, and the consequent means of getting about with any degree of comfort, yet, as Thos. Jefferson puts it, where "Nature's God" has done so much to our advantage, the council cannot spoil it all at once.

There have been no nuisances reported. Last year we had a number of privies constructed so that this year there has been no demand for them.

On September 5, 1898, the four-year-old son of Prof. O. A. Peters returned home from Columbus with what seemed to be a malignant sore throat. The premises and family were quarantined, but the bacterologist of the State Board of Health failed to find any of the characteristic bacilli of diphtheria.

During the last week of November and the first week in December there was a quarantine card put on the house of Henry Roese when his three or four-year-old boy was sick. As the doctors — as report had it—practiced intubation I suppose it to have been membranous croup, but neither the attending nor consulting physician ever reported the case to the board of health.

From December 15, 1893, to January 6, 1894, I vaccinated fifty-two school children, thirty-seven of them for the first time. Nearly or quite all of the other fifteen children had been successfully vaccinated previous to this time.

January 29, 30 and 31, 1899, I vaccinated thirty-seven children and two more in April. Our school children need vaccinating now, but the council spent nearly all the corporation money on the streets, so that I expect that nothing will be done with regard to it this winter.

Our board of health held six or eight regular monthly meetings and two or three called meetings. It is kept well enough organized to be ready for business upon an emergency. Its expenses for the past calendar year amounted to $12.60.

I fear I can offer no suggestions of any value.

SOUTH CHARLESTON, CLARK COUNTY.

C. A. Grahn, M. D., health officer.

Population (estimated), 1,200.

Sanitary measures have been promptly complied with during the year, excepting having a dump ground supplied. Garbage, etc., has been disposed of otherwise, by burying in gardens.

Have had a few cases of diphtheria and typhoid fever, but not to an alarming extent. Have had and are still having a general disposition to acute catarrhal inflammation, which has prevented in a great measure energetic vaccination.

The most difficult matter is to get a response in form of a board meeting. The business and labor of the health interest and sanitary condition is almost entirely left with the health officer and sanitary marshal. Always has been so here. I would be pleased if the State Board would in some way urge the necessity, upon our council, to procure a dump ground.

Infectious diseases reported during the year: Diphtheria, 2 cases; typhoid fever, 3 cases.

SOUTH SOLON, MADISON COUNTY.

Dr. W. F. McCormick has moved to Seattle, Washington.

We have no board of health in South Solon, but I do not think there is a town in the State that needs one any worse than we do, and would request that you urge the importance of having one organized here at an early date.

J. W. ORR, P.M.

SPENCERVILLE, ALLEN COUNTY.

C. H. Baum, health officer.

Population (estimated), 2,000.

The general sanitary condition is good, with the exception of a large ditch running through the east part of the town and emptying into the canal. This ditch should run *under* the canal, and it would then follow the natural water course. When the canal is full of water it backs up into the ditch and stagnant water lays there for several months during the year. This should be investigated by the State Board and remedied during the coming spring. It is a matter that needs attention, for it is not only an obnoxious nuisance, but a breeder of disease. It is clearly the duty of the State Board of Public Works to make this improvement, and they should be ordered to do so by the State Board of Health.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 8 cases; typhoid fever, 12 cases.

SPRINGBORO, WARREN COUNTY.

James B. Haines, health officer.

Population (estimated), 500.

Streets, alleys and yards are in a good sanitary condition.

Sewerage is good. No nuisances. Night-soil is buried and garbage carted away.

Contagious diseases are reported, a record of same kept and the board enforces proper measures.

Mumps have been more prevalent than usual.

Vaccination has been general. There are but few scholars in the schools unvaccinated.

The board of health met four times during the year ending December 31, 1898.

Amount of money spent during the year, $15.85.

Smallpox scare was about all the danger there has been here during the year, but the board took proper precautions and prevented its spread.

The board will be reorganized in April under a new ordinance.

Infectious diseases reported during the year: Mumps, 6 cases.

SPRINGFIELD, CLARK COUNTY.

Henry H. Seys, M. D., health officer.

Population (estimated), 40,000.

Sanitary condition except in the matter of sewers good. Water supply abundant and good. Alleys and streets not kept as clean as could be desired; cause lack of funds. Board of health composed of members of board of public affairs, meet every week, and have been willing to do all in their power to improve sanitary condition of city. Contagious diseases fairly well quarantined. Have been kept in check reasonably well. Not much trouble in abating nuisances.

Sewers of city imperfect, deficient and discharging into natural streams flowing through the corporation. During summer months not sufficient water flow to flush bed of streams, and they become a grave menace to the health of all affected by them.

No proper provision for removal of night-soil and garbage. Vaults cleaned by private contract, and in a way that at times is offensive. Garbage gathered and hauled out of city by wagons employed by board of public affairs. Service not good; too few wagons and haul too long.

Contagious diseases not reported as promptly as could be wished. Physicians shield themselves behind the excuse of failure to diagnose the case. Injury and death have resulted therefrom in not a few instances.

Restrictive measures have been fairly well enforced during the year.

No contagious disease especially prevalent during year.

Cannot say as to number of vaccinations. Health officer vaccinated nearly 900. Very large per cent. of children have been successfully vaccinated.

Board of public affairs meet weekly and attend promptly to any matters brought to their attention by health officer.

Amount expended for sanitary purposes during year $3,503.45, including all hauling of garbage, etc., salaries, disinfection of contagious diseases, etc.

Five actions have been brought by health officer to abate nuisances. Twice parties plead guilty and paid a fine. Three failures to convict. Will give the same party another trial when hot weather renders his place of business offensive.

Board of health as now organized good and efficient. Cannot predict the future.

No report has been made as to number of cases of typhoid fever or whooping cough. There have been no deaths reported from the latter and but nine from typhoid fever.

Infectious diseases reported during the year: Diphtheria, 65 cases; membranous croup, 12 cases; scarlet fever, 114 cases; typhoid fever, 9 cases; measles, 89 cases.

SPRING VALLEY, GREENE COUNTY.

Arch Copsey, health officer.

Population (estimated), 600.

Number of meetings of board of health during 1898, seven.

The village is in very good condition with the exception of one part, and that part is subject to the overflow of water from the river. I think this was caused by the county commissioners putting up a high grade between the town and river, which caused the water to back up. The water gets about three and one-half feet in some of the houses.

There were four or five cases of typhoid fever in one family last fall in this part of the town. Such will be the case this coming spring if things are left in the same condition.

I wish you would come down and look after this grade business, and see if it is the proper kind of a grade to keep up and back the water on those people. We tried to get the county commissioners to do something for it, but we have failed.

There has been but very little money spent by the board.

There are about twenty out of 148 children attending school who have never been vaccinated.

STEUBENVILLE, JEFFERSON COUNTY.

John Welch, health officer.

Population (estimated), 12,000.

Our streets and alleys are in very good condition. The sanitary condition of the city generally is very satisfactory. There have been no nuisances which have not been abated without much trouble. The board leased a small tract of ground, and night-soil and garbage is disposed of by digging trenches, into which it is dumped, and then covered immediately.

Contagious diseases are promptly reported, and thus far the health officer has experienced little, if any, opposition in enforcing restrictive measures. During the past year we have had both scarlet fever and diphtheria, but not a great deal of either. No vaccination has been done this year, but in the fall of 1895 it was very thoroughly attended to throughout the city. The subject has been discussed a little in the board meeting, but as there has been no case of smallpox in our vicinity, no active measures have been taken.

The board of health has held twelve meetings during the year.

Two prosecutions for the violation of the hog pen ordinance were brought. Both resulted in the enforcment of the ordinance

The amount of money expended by the board in the year was about $650.

I am unable to give mortality report because physicians persistently neglect to report deaths.

SUGAR GROVE, FAIRFIELD COUNTY.

Dr. Samuel Renshaw, health officer.

Population (estimated), 400.

The year has been exceptionally healthful. The sanitary condition has been and is good. The streets and alleys are kept clean, free from weeds and rubbish. Manure and garbage are eagerly sought after and carted away by farmers. Night-soil is buried in privies, and thus much valuable fertilizer is temporarily lost. First-rate care is bestowed upon lawns, shade trees, the lots and homes of our citizens.

Contagious diseases are properly reported, records of them are kept and restrictive measures enforced. Records of births and deaths are kept. Schools are carefully examined and village prison is maintained in good sanitary condition. We are pleased to report hearty coöperation from our efficient township board.

Our board meets monthly. No prosecutions for violations of health laws. Amount expended about $25. None vaccinated during year.

SUMMERFIELD, NOBLE COUNTY.

John E. Moseley, health officer.

Population (estimated), 600.

Streets, alleys and back yards are kept in fairly good condition. There are some complaints about drainage, caused by culvert being stopped. All nuisances reported to the board of health were removed at once, except hog pens, it took some time with them, but were cleaned at the last moment. The night-soil and garbage are buried in pits or hauled out onto the fields.

All contagious diseases are reported, I think, but the clerk lost the books, and we can find nothing back of January 3, 1899. The board of health has had no trouble with contagious diseases, to speak of. Whooping cough, scarlet fever and measles would break out, but were quarantined and soon stopped. I could not find out how many were vaccinated, but they were few in school, something near 75 unvaccinated.

Our board has met seven times and spent $12.50, but has not been compelled to use the law. Boards of health should be independent of village council.

SWANTON, FULTON COUNTY.

Dr. W. A. Scott, health officer.

Population (estimated), 850.

Streets, alleys and yards in good condition. Sewerage good. Privy vaults are generally in good condition, most of them are cleaned twice a year, lime and dry earth being used for disinfecting during warm weather.

Measles became so numerous in the village and surrounding country that, after the thirty-two cases reported, we quit trying to quarantine. I think it safe to say that we had from fifty to seventy-five cases. There has been no compulsory vaccination and, in all probability, no large number of school children have been vaccinated.

Eight meetings held by board in 1898, expenses of board being about $9. No prosecutions. Record of all contagious diseases reported kept.

Infectious diseases reported during the year: Diphtheria, 2 cases; measles, 32 cases.

SYCAMORE, WYANDOT COUNTY.

R. S. Galleher, health officer.

Population (estimated), 900.

The health of the citizens of our little village has never been better than it has for the past year. Only four cases have been reported to this office during the year and there has been scarlet fever reported within the last twenty days.

Immediately upon receiving the first report the board was called together and action taken to at once close the public school which was done. The school is still closed but will open Monday, January 9, as the doctors have given us their opinion that there will now be no danger.

The sanitary condition of our village is as good as it can well be made considering that we have no system of sewerage. As you are aware we put in this summer a system of water works of which we are justly proud, and which gives to the citizens the purest water obtainable. The streets are in fair condition for this time of year. Considerable mud, of course, but as soon as the weather permits, the board will see that the streets are properly cleaned.

I cannot give the number of meetings held by the board for the reason that they meet when it is necessary, sometimes two or three times a week and again not for months; but all are interested in keeping the sanitary condition good.

Our board has not spent much money this year. No prosecutions have been necessary, and I think $50 will cover all expenses, which we consider very low for the amount of work we have had done, and were it not for the fact that our citizens are interested in the health of the town it would have cost much more.

We have not enforced a vaccination rule, several have been vaccinated but I cannot give the number.

Infectious diseases reported during the year: Scarlet fever, 4 cases.

SYLVANIA, LUCAS COUNTY.

Dr. G. A. Crandall, health officer.

Population (estimated), 600.

The present sanitary condition is good. The board has maintained an active organization. Streets and alleys are in good condition. No sewerage except natural drainage.

Contagious diseases are reported and a record is kept. Have had no contagious diseases. About ninety persons attending school who are not vaccinated.

The board has held nine meetings.

Thirty dollars and fifty cents was spent by the board the last year.

TAYLORSVILLE, MUSKINGUM COUNTY.

Joseph H. Green, health officer.

Population (estimated), 600.

Our health board held three or four meetings during the year 1898. We are arranging so as to put every privy vault on a thorough legal health basis, and we rest easy that it will be done. Our streets and alleys are fairly clean, and we expect still further cleanliness.

We have had no expenses the past year

Infectious diseases reported during the year: Typhoid fever, 8 cases; measles, 2 cases.

TIFFIN, SENECA COUNTY.

Dr. A. C. Schwartz, health officer.

Population (estimated), 15,000.

Our streets, alleys and yards are in good condition. No cause for complaint of sewerage. We abate all nuisances. We have a scavenger who removes all night-soil and buries it on a farm outside the city, using barrels for its removal.

Contagious diseases are reported and we keep a record. We are able to enforce all measures. Typhoid fever has been about the only contagious disease we have had.

There are about 1,300 unvaccinated children in our schools.

Our board has held twenty-six meetings during the year. Total amount spent, $2,567.17. We have had no prosecutions worthy of notice.

Infectious diseases reported during the year: Diphtheria, 4 cases; membranous croup, 3 cases; typhoid fever, 29 cases.

TOLEDO, LUCAS COUNTY.

J. T. Woods. M. D., health officer.

Population (estimated), 151,520.

Streets, alleys and yards are in a cleanly condition. There is no complaint from lack of sewerage excepting on the outskirts. There are no nuisances which the board was unsuccessful in abating. Night-soil and garbage are taken to the country and buried.

Contagious diseases are properly reported and a record kept of them. The board has been able to enforce restrictive measures with more or less trouble. Scarlet fever and diphtheria have been more prevalent than usual. The estimated number of persons vaccinated during the year is 1,000. I was unable to ascertain the number of unvaccinated children attending school. The board held twelve meetings during the year. The total amount spent, $14,802. Six arrests were made by the board. One for failing to clean vault. Nuisances abated and case dismissed. Two for dumping decayed fish on street. Cleaned and case dismissed. One for keeping cows in residence part of city, poor barn facilities. Cows taken out of town and case dismissed. Two for working on oil from burnt grain, causing a bad odor. Case dismissed as work was ceased. I have no suggestions to offer for improving the form or character of our present health boards.

TONTOGANY, WOOD COUNTY.

R. J. Collin, health officer.

Population (estimated), 500.

The sanitary condition of the town is good. The board of health had the town thoroughly cleaned up this last summer. We have four town wells, bored to the rock, about 108 feet deep, from which a large per cent. of the inhabitants get their water during the summer and fall. The town is thoroughly tiled. Our town is one of the healthiest towns in the county.

Infectious diseases reported during the year: Typhoid fever, 5 cases; measles, 10 cases.

TROY, MIAMI COUNTY.

Thos. M. Wright, M. D., health officer.

Population (estimated), 5,000.

The sanitary condition of our town is good. We need a sanitary sewer, as the hotels and many large establishments use nothing but sinks, and our soil is gravely subsoil and they infect all the wells in the neighborhood. We have splendid Holly water works and abundance of good water, and are condemning the wells as fast as complaint comes in.

We need more rigid quarantine of consumptives. Servant girls are allowed to work in families when they (the servant girls) have tuberculosis and are so proven by microscopy. This should not be. There is no inspection of milk.

Night-soil removed in sealed barrels. Garbage removed in covered tanks.

Contagious diseases reported, except measles and phthisis pulmonalis. Restrictive measures are taken. Have had few contagious cases, except measles, which were most frequent. There has been virtually no vaccination done here since 1893. I and one member of the board of health endeavored to secure compulsory vaccination, but the board would not order it. Superintendent of schools has no means of knowing how many have not been vaccinated. My opinion is that fully one-third of the children now in the public schools of Troy have never been vaccinated. The same holds as to the parochial schools.

Our board of health keeps up a regular organization, and usually meets the first Monday night in each month. Sometimes it fails to meet. The board spent about $250 last year.

The board has never succeeded in getting the city council to make a levy for a fund for the board of health, and after haggling for three or four months over the bills, and a few threats to sue the city, they pay the bills.

Infectious diseases reported during the year: Diphtheria, 4 cases; scarlet fever, 2 cases; measles, many cases, none reported.

TUSCARAWAS, TUSCARAWAS COUNTY.

M. A. Romig, acting health officer.

Population (estimated), 600.

No health board existing, as no one will serve. Streets and alleys cleaned. A better sanitary condition than in neighboring towns. Town ordinances with reference thereto enforced.

Make it my business to inquire of physicians regarding infectious and contagious diseases. Health good this winter, except a number of cases of grippe and colds. Nothing menacing the health of the community now, unless it be a Methodist revival lately started.

Expenditures were $20.

In answer to last sentence and clause will suggest that the old health laws, making the mayor and resident physicians, the health officers, and the council the health board, should be restored, to apply to all villages of 1,000 population or less, for the reason that it is practically impossible to secure a separate board of health in small towns, as well as to create the extra expense incurred, or rather to accumulate the necessary funds without onerous taxation. I find that our council in the last ten years always hesitated to vote the amount necessary or required under the present law. If the State Board will secure the amendment above referred to you will find much more satisfactory results, and better reports. Besides, the extra duty on the mayor will go in with the rest of his labors at the same salary, and the doctors will not make any charges. Please look over the matter.

Infectious diseases reported during the year: Diphtheria, light, 2 cases; typhoid fever, 2 cases.

UHRICHSVILLE, TUSCARAWAS COUNTY.

Dr. James G. McCollam, health officer.

Population (estimated), 5,000.

Our physicians as a rule report all right. We furnish postal cards for notification of contagious diseases; these are filed and is all the record we keep. Have no difficulty in having orders as to quarantine obeyed. Caused three arrests for violation of scavenger regulations; secured conviction and fine in one case. We have had a little more diphtheria and typhoid fever than usual. I know of two vaccinations last year. The board of health asked the superintendent of schools to furnish a list of unvaccinated children, and he, with the sanction of the school board, refused, saying there was no danger of smallpox, and he did not think best to excite the pupils. Our streets and alleys are pretty fair. Our sewers are all right. We are building sanitary sewers as fast as possible, over 1,000 feet in 1898. We had trouble with some stables this year. We have a system by which we license scavengers to haul night-soil.

Our board could be improved by getting the members interested. When they get interested we do whatever we think is proper.

We have now ready to adopt a set of regulations providing for the registration of dealers and inspection of milk and meat places; also a regulation providing for owners of buildings furnishing water-closet facilities, etc.

Our board has had eleven meetings in 1898. Amount spent by board of health, $227.70.

Infectious diseases reported during the year: Diphtheria, 22 cases; membranous croup, 3 cases; scarlet fever, 4 cases typhoid fever, 12 cases; chicken-pox, 2 cases.

UNION CITY, DARKE COUNTY.

James F. Bolen, health officer.

Population (estimated) 1,800.

Following the order as designated: The streets, alleys and yards with but few exceptions are in a cleanly condition. While I will not say that the sewerage system of our village is perfect, yet I do not think there can be any serious complaint made of the same. The only complaints that I have heard were of the insufficient size of two branch sewers to carry off the surface water in times of heavy rains, but barring heavy rains, the sewers are sufficient.

There were two nuisances, of which orders to abate the same were partially disregarded. One was the accumulation of refuse matters from a grocery, such as decayed vegetables and fruits, spoiled canned fruit, old barrels and boxes, etc. The party maintaining the nuisance has a mania for gathering such trash. The other consisted of the unkempt and unsanitary condition of premises. The work of abating these nuisances has been postponed until spring, when extreme measures will be brought to bear on the parties maintaining the same.

Night-soil is removed from vaults and put in air-tight tanks, and disposed of in conformity with provisions of section 6923, Revised Statutes.

Contagious diseases are properly and promptly reported by physicians and a record made of same. The board has experienced no trouble in enforcing proper restrictive measures in cases of contagious diseases. There has been no vaccination of persons in the last year to my knowledge. The estimated number of pupils attending the public schools who are unvaccinated is 122.

The number of meetings held by the board during the year, fourteen. Total amount of money spent by the board including salaries $27.50. The board has had no litigation on account of violation of its orders.

I have no suggestions to offer for the improvement of our present health boards.

Infectious diseases reported during the year: Typhoid fever, 3 cases.

URBANA, CHAMPAIGN COUNTY.

Dr. H. M. Pearce, health officer.

Population (estimated), 7,500.

Streets, alleys and yards are in a cleanly condition. There is no cause for complaint from lack of sewerage or improper disposal of sewage. There have been no nuisances which the board was unsuccessful in abating. We require all persons who clean vaults and remove night-soil and garbage to obtain a license from the mayor. Every applicant for such permit must have a proper outfit to be approved by the mayor and health officer, and can only engage in the work between the hours of 10 P. M. and 4:30 A. M.

Contagious diseases are properly reported. A record of such is kept. The board has been able to enforce proper restrictive measures. No contagious diseases have been more prevalent than usual. The estimated number of persons vaccinated during the year, 200. Total enrollment of school children, 1,003. Number not vaccinated, 190.

The board held eleven meetings during 1898. Total amount spent during year, $87.70, of which $30.70 was for bacteriological examinations. No prosecutions were brought by the board during the year. I have no suggestions to offer.

Of the nine cases of typhoid fever reported in six instances the disease was contracted elsewhere, and the patients came here with the fever developed.

Of the twenty-seven cases of measles reported, twenty-two were rotheln.

UTICA, LICKING COUNTY.

Dr. G. W. Garrison, health officer.

Population (estimated), 800.

Our board of health has had some meetings during the past year, 1898, but having no epidemics and no nuisances to abate our board has not been meeting regularly every month as in former years. No garbage allowed to remain within corporation.

Town well underdrained. Alleys and streets are kept well cleaned up. School children generally vaccinated. There are some pig pens in our town. When weather becomes hot in late summer and early fall months they cause a repulsive odor within their vicinity, which requires the health officer to abate and have cleaned up.

Infectious diseases reported during the year: Whooping cough, 5 cases; chickenpox, 5 cases.

VAN BUREN, HANCOCK COUNTY.

N. W. McCaughy, mayor.

Population (estimated), 350.

We have a board of health but it is hard to keep it organized. The health of our village is good, we are situated on high ground and have good drainage. We expect to have a system of drainage next summer.

VAN WERT, VAN WERT COUNTY.

Dr. E. L. Wilkinson, health officer.

Population (estimated), 7,500.

Streets and alleys are clean. The town is well drained with underground pipe, but there is no system for carrying sewage. All drainage tile that is provided with stench trapped wells and that empties into Town creek is eligible for water-closets, hence all sewage of the town empties into Town creek. The board has removed all nuisances it undertook. Night-soil and carcasses of dead animals are provided with a burial ground outside the corporation.

Only smallpox, diphtheria, scarlet fever, measles, and membranous croup, are properly reported. No record is kept of contagious diseases not reported.

Probably 300 were vaccinated, and about 150 school pupils that have never been vaccinated.

The board met about fifteen times, and spent about $2,400. There were several prosecutions: one for keeping hogs, two for burying night-soil in old vaults.

There should be a county health officer who should be provided with a microscope and other instruments, and it should be his duty to inspect all dairies and see that all boards within his county do their duty.

Infectious diseases reported during the year: Membranous croup, 1 case; scarlet fever, 3 cases; smallpox, 17 cases; measles, 2 cases.

VERSAILLES, DARKE COUNTY.

Dr. W. C. Gutermuth, health officer.

Population (estimated), 1,600.

Streets and alleys are in good condition. The board has had no difficulty in abating nuisances. All night-soil and garbage are taken to the country and either buried or plowed under.

The board keeps a record of cases of scarlet fever, smallpox, diphtheria, membranous croup, measles, chicken-pox, and whooping cough, when reported, but not of typhoid fever. The board requires that cases of scarlet fever, smallpox, diphtheria and membranous croup be reported and that all cases are properly isolated and quarantined.

There was no one vaccinated during the past year.

The board held six regular meetings during the year. Amount spent by order of board, about $50, excluding officers' salaries.

Infectious diseases reported during the year: Scarlet fever, 2 cases; measles, 3 cases.

WADSWORTH, MEDINA COUNTY.

Dr. C. N. Lyman, health officer.

Population (estimated), 2,000.

The sanitary condition is very fair. The health board has not maintained an organization for six months past. Differences between the board and the mayor caused them all to resign. A new board appointed a few days since, but up to this date not sworn in, will be on the 19th inst. (likely).

The abatement of nuisances and the prevention of contagious diseases has been very well looked after by the citizens under direction of the health officer.

The streets and alleys are in fair condition. The health board has not tried to abate any nuisance, except the foul water supply. Public complaint and other causes remedied that evil in a measure. Night-soil is largely cared for by the occupants, otherwise by a scavenger, who does so at the expense of the owners of the premises.

Mild cases of scarlet fever, where no physician is called, are not reported, for fear of quarantine, otherwise well reported. No other contagious disease prevalent. Of the 450 pupils 200 are not vaccinated.

The local board, as a rule, met twice per month, since the rupture with the mayor not at all. As a board, they have not spent any money. At their recommendation the city council has paid a sanitary policeman small fees for posting cards, etc. There have not been any prosecutions by the board of health.

For the improvement of health boards, define the number of meetings to be held in each month, and give each member a compensation. (Men fit for health boards are men of business, and it is a tax on them which they will shirk when their business suffers).

Pay the health officer, his is the most thankless task of all. He is looked upon as a spy, and attending to everybody's business but his own.

WAPAKONETA, AUGLAIZE COUNTY.

A. Kohler, health officer.

Population (estimated), 4,500.

This board held 16 meetings, issued 34 nuisance notices, recorded 70 births; first ward, 21; second ward, 27; third ward, 22; total, 70; 37 males and 33 females.

Mortality for each month: January, 2; February, 3; March, 4; April, 3; May, 2; June, 2; July, 4; August, 3; September, 5; October, 5; November, 1; December, 2; 23 males, 13 females; total, 36; 10 died under 5 years; none between 5 and 20; 5 between 20 and 30; 1 between 30 and 40; 11 between 40 and 60; and 9 lived to be over 60.

During the year seventy-five cases of contagious disease were reported, of which not a single case proved fatal.

Officers:

J. G. Heinrick, president.

A. Kohler, clerk and health officer.

W. L. Melching, sanitary police.

Members: D. A. Siferd, N. Shubert, J. W. Veit, R. Lang, Dr. E. R. Freeman, A. L. Fisher.

Infectious diseases reported during the year: Smallpox, 75 cases.

WARREN, TRUMBULL COUNTY.

Dr. Delbert E. Hoover, health officer.

Population (estimated), 11,100.

Enclosed will be found our 1898 report in unabridged form, giving in detail, as near as possible in a report, the work for the year.

In reply to suggestions, we can report that our streets are in very good sanitary condition, being supplied with good sewer and draining facilities. Our sewers discharge into the Mahoning river, two trunk sewers in the business and residence portion of town, which have been a subject of discussion by the board and citizens alike, as to the best manner of providing other discharge. The other trunk sewers empty below the city. The sewerage system here has been investigated at several times by the State Board. The principal nuisance, and the oldest on the docket, is on account of the old canal (abandoned) bed, which it has been decided to fill, and work is now in progress of filling.

Warren has a system of collecting night-soil and garbage and transporting it to the dump ground two miles below the city, where it is cured by a city scavenger under contract.

Contagious diseases are reported to the health department, and during the year over 300 houses have been placarded, measles being the cause of nearly all cases. A record of all such diseases is kept by the department, and there has been but little opposition to the regulations prescribed for quarantine. We have not kept a record of the number of vaccinations during the year, but a crusade has lately been started on the unvaccinated school youths, of which about 1,000 out of 2,800 are reported as being unvaccinated. This matter is being taken up with vigor by the board, and has been referred to the health officer, to commence as soon as possible and conditions are favorable.

During the year the board has held seventeen meetings, and the expenses, from all causes, have been $1,056.03.

There were seven warrants taken out during the year, in each case of which prosecution was successful, and fines and costs collected, as follows:

Allowing dead animal to remain on street	1
Committing nuisances	3
Moving corpse, without permit	1
Allowing running of chickens out of season	1
For non-elevation of foodstuffs on streets	1
Total	7

Amongst the subjects that might be beneficial to health boards, that they may become elective offices, instead of appointive ones, thus giving a more democratic choice of legislators by the voice of the people direct. One other item would be to allow the boards to make their own levy and have direct charge of the sanitary fund, thus placing the payment of bills on a more speedy system than at present, where they have to be certified to city council, and probably that body failing to quorum, thus causing the board's creditors to wait until "next meeting."

Infectious diseases reported during the year: Scarlet fever, 6 cases; typhoid fever, 2 cases; measles, 295 cases.

WASHINGTON, GUERNSEY COUNTY.

S. B. Lawrence, health officer.

Population (estimated), 600.

The sanitary condition of the village is fairly good. The board of health has not been very active, but is ready and has the disposition to back up the health officer in his enforcement of the proper means for the prevention of contagious diseases, etc.

Infectious diseases reported during the year: Typhoid fever, 6 cases.

WASHINGTON C. H., FAYETTE COUNTY.

J. M. Edwards, health officer.

I think the sanitary condition of Washington C. H. will compare favorably with any city of its population in Ohio. The great need of our city is proper sewerage. Our board has not met regularly, only meet at call of president. As a rule our people willingly comply with all requests of the health officer, who, in fact, does about all the work. We have had no contagious diseases but measles, one typhoid fever, one scarlet fever; all placarded. Streets and alleys clean. Night-soil hauled to the farms. About 200 have been vaccinated and the rest will be.

No suggestions at present. The forms are good if adhered to.

Board of Health,
Washington C. H., Ohio,
January 5, 1899.

The city board of health adopted the following:

Resolved, That J. M. Edwards, health officer, be appointed and authorized to have vaccinated successfully the persons provided for in section 172, Revised Statutes of Ohio, at a cost not to exceed 25 cents each. And that the health officer notify all such persons, not otherwise provided for, to call upon their family physician for such free vaccination.

E. C. Hamilton,
Clerk.

Infectious diseases reported during the year: Scarlet fever, 1 case; typhoid fever, 1 case; measles, 38 cases.

WASHINGTONVILLE, COLUMBIANA AND MAHONING COUNTIES.

Dr. H. C. Seifert, health officer.

Population (estimated), 1,200.

The sanitary condition is that of the average village. The night-soil is disposed of at the pleasure of the property owner. This evil can only be remedied by having better health boards.

Contagious diseases have been properly reported during my term as health officer but no record of them has been kept.

There have not been proper restrictive measures, because of the indifference of the local board. Measles, scarlet fever and diphtheria have been most prevalent.

There have been no vaccinations during the past year. About all of the children in first and second grades have not been vaccinated; number estimated, 150.

There has been four or five meetings of the board of health. Amount of money spent, $50.

No prosecutions, but should have been some.

Would suggest that some measures be introduced to have more interest manifested by local boards; also that the laws be strictly enforced.

Infectious diseases reported during the year: Diphtheria, 13 cases; scarlet fever, 12 cases; typhoid fever, 5 cases; whooping cough, 2 cases; measles 50 cases; other infectious diseases, 3 cases.

WAVERLY, PIKE COUNTY.

George D. Emmitt, health officer.

Population (estimated), 2,000.

I am pleased to be able to say that the sanitary condition of our town is good, and has been kept so during the year past. Have had very little trouble in enforcing sanitary rules in respect to general cleanliness.

Night-soil is removed at night by professional parties having necessary equipments, and deposited by direction of our board of health. Contagious diseases are promptly reported and dealt with according to requirements. About 5 per cent. of our school children have not been vaccinated. We have had nine cases of diphtheria, one death. These cases were in eight families and confined there. Our town is now free from any contagious or infectious diseases. Our board of health has met monthly. Our total expenses for the year was $125; $100 to health officer and $25 to clerk. No occasion for prosecutions in the past year; in fact, we are getting along nicely.

WAYNESFIELD, AUGLAIZE COUNTY.

F. M. Berry, health officer.

Population (estimated), 600.

No report.

Infectious diseases reported during the year: Diphtheria, 1 case; smallpox. 1 case.

WAYNESVILLE, WARREN COUNTY.

Dr. W. E Oglesbee, health officer.

Population (estimated), 700.

The sanitary condition of our village is fair. We have done the best we could, owing to the lack of a place to dispose of garbage by burial. The law in regard to the disposal of garbage in that manner cannot be obeyed in this community without more expense than we can stand, especially owing to the fact that the council did not levy any tax for sanitary purposes last spring. The streets, alleys and yards are kept in fair condition. Part of the town should be sewered.

The nuisance of slaughter houses in the corporate limits should be removed, but there is no way of doing it. Night-soil is buried after being treated with lime by property owners. There is no place to put garbage.

Contagious diseases are reported, except whooping cough, and a record kept of cases reported. In such cases the board has always been able to enforce the rules without trouble and thereby avoiding epidemics.

About fifteen people have been vaccinated during the year. Probably 5 per cent. of the school children have not been vaccinated.

There have been eleven meetings of the board during the year, and we have spent $57.20. There have been no prosecutions for violations of rules.

Would it not be better if the town and township boards were one and the same body, with the same health officers, that is, in towns which do not cover a whole township? It seems to me that better work could be done, and more uniform records kept.

WELLSTON, JACKSON COUNTY.

Thomas Wilson, health officer.

Population (estimated), 8,000.

Our streets, alleys and yards are in a good condition. We have no system of sewerage, but need one very much.

There are no nuisances which the board has tried unsuccessfully to abate. We have an air-tight tank in which we haul night-soil to the garbage ground, located one and one-half miles from town, where it is buried. We removed 411 nuisances in 1898.

Contagious diseases are properly reported and a record of such diseases kept. The board has been able to enforce proper restrictive measures. Diphtheria and typhoid fever have been more prevalent than usual. No persons have been vaccinated during the year. There are 1,326 unvaccinated pupils attending the public schools.

The board of health has held eight meetings during the year. The total amount spent by the board of health for the year is $25.

The board of health had no prosecutions last year.

We have no suggestions to offer for improving the form or character of our present health boards.

Infectious diseases reported during the year: Diphtheria, 2 cases; membranous croup, 2 cases; typhoid fever, 2 cases; whooping cough, 2 cases.

WELLSVILLE, COLUMBIANA COUNTY.

J. T. Warren, health officer.

Population (estimated), 6,500.

Streets and alleys are not kept in a cleanly condition and are never cleaned except when the health board compels council to have it done. The yards are kept in a fairly clean condition. There is complaint of a lack of sewerage, as we have no system of sewerage.

There are no nuisances, to our knowledge, which we are unable to abate. We do not dispose of the public's garbage, but night-soil is hauled into the country by a farmer.

Contagious diseases are properly reported and record of such cases is kept. Have had no trouble in enforcing restrictive measures. Contagious diseases have not been any more prevalent than in other seasons. Estimated number vaccinated, 150; number unvaccinated attending public school, 228; number unvaccinated attending parochial school, 26; total, 254.

The board of health held sixteen meetings in the year 1898, and expended during same year about $600.

The board prosecuted several cases, viz.: five cases for throwing garbage on streets, parties plead guilty and were fined; one case for running dirty water on street and causing stagnant pool, but ordinance was defective and the case was thrown out.

Infectious diseases reported during the year: Diphtheria, 26 cases; membranous croup, 5 cases; scarlet fever, 3 cases; typhoid fever, 18 cases; measles, 2 cases; chicken-pox, 11 cases.

WEST ALEXANDRIA, PREBLE COUNTY.

W. W. Crouse, health officer.

Population (estimated), 800.

Streets, alleys and yards in fair sanitary condition. Some complaint as to sewerage. The board has experienced some difficulty in abating nuisances arising from the unclean condition of pig pens.

With regard to night-soil and garbage the village has no arrangements, the individual takes care of this himself.

No contagious diseases have been properly reported. It was the intention of the board to keep a record of such diseases and record books provided for such purposes were bought, but so far we have had but little use for them. The board has been unable from several causes to be effective. For some unaccountable reason the council has been unfriendly, and the board has had but four members for sometime, and is not full at present unless the last appointee changes his mind.

The diseases most prevalent in the past year were malarial typhoid fever and water-pox, with a few isolated cases of measles and scarlet rash.

We do not know of any vaccination except for the purpose of ascertaining whether or not "water-pox" was anything more than boils, as shown the Secretary of the State Board when here.

The board has held two regular meetings during the year 1898. Total amount spent, including the health officers' salary, $50.90. No prosecutions on account of violations, as our rules had not been published as required by law.

If we meet on January 19-22 next, I may make some suggestions, besides stuffing the querry box.

We have had no deaths during the year.

WESTERN STAR, SUMMIT COUNTY.

P. A. Johnson, health officer.

Population (estimated), 175.

We have adopted strict quarantine rules and disinfect thoroughly.

The board has held six meetings. Total amount spent $5.

No cause of complaint. All cases are reported according to law.

Infectious diseases reported during the year: Diphtheria, 1 case; membranous croup, 6 cases.

WESTERVILLE, FRANKLIN COUNTY.

James D. Budd, health officer.

Population (estimated), 1,800.

The sanitary condition is good. The board of health has one meeting each month in the year.

WEST JEFFERSON, MADISON COUNTY.

W. R. Borland, health officer.

Population (estimated), 1,100.

Sanitary condition good. Number of meetings 11. Amount of expense $39.

Infectious diseases reported during the year: Diphtheria, 3 cases.

WEST LEIPSIC, PUTNAM COUNTY.

W. L. Pritchard, health officer.

Population (estimated), 530.

I was appointed health officer November 4, 1898. Previous to that time I have no record.

Infectious diseases reported during the year: Diphtheria, 2 cases.

WEST LIBERTY, LOGAN COUNTY.

Dr. R. M. Fulwider, health officer.

Population (estimated), 1,500.

Streets and alleys, also yards are in a very good condition. Sewerage seems to be all right. We have been trying to abate a nuisance in the ditch that runs through the railroad property, but do not know how to proceed. Night-soil is removed by a regular vault cleaner under the direction of the health officer.

Contagious diseases are reported and there is no trouble to enforce proper restrictions. We have no contagious diseases of any note during the past year. There were about two hundred persons vaccinated during the year. There are not over seven or eight children attending school who have not been vaccinated.

There were eight meetings held during the year. There was expended during the year $92.50. No prosecutions during the year. Have nothing further to suggest.

Infectious diseases reported during the year: Scarlet fever, 1 case; typhoid fever, 4 cases; measles, 10 cases.

WEST MANCHESTER, PREBLE COUNTY.

T. R. Osterhaus, health officer.

Population (estimated), 375.

No report.

Infectious diseases reported during the year: Typhoid fever, 4 cases; whooping cough, 10 cases; measles, 15 cases.

WEST MANSFIELD, LOGAN COUNTY.

Dr. J. W. Arbegast, health officer.

Population (estimated), 600.

Our board was organized August 1, 1898. It has taken but very little pains to clean up, has allowed about fifty hogs to be kept in corporation. I have been very careful to have all contagious and infectious diseases reported. Our night-soil has been allowed to be buried in corporation. We have no sewerage. Our streets are cleaned once a week, alleys are somewhat dirty.

There have been very few vaccinated. We ordered the school board to vaccinate all children that had not been in the last five years, and they said there was only a few that had not been. I have made an investigation of unvaccinated and find 88. Our expenses were $38.

We have had four meetings. We are going to keep a record of all diseases that are contagious and infectious.

Infectious diseases reported during the year: Typhoid fever, 6 cases; measles, 15 cases.

WEST MILTON, MIAMI COUNTY.

Dr. Gainor Jennings, health officer.

Population (estimated), 900.

The present sanitary condition of our village is good, but not perfect.

The board of health has maintained an active organization, and has been successful in enforcing proper measures for the prevention of contagious diseases and the abatement of nuisances.

The streets, alleys and yards are in as cleanly condition as could be expected without systematic arrangements for the removal and disposition of garbage.

Night-soil and garbage are taken, at least twice a year, across the river on the Sleppy farm. The hog pen nuisance causes more trouble than anything else.

Contagious diseases are properly reported, except whooping cough and typhoid fever. A record of contagious diseases is kept. There has been no epidemic of any contagious disease in our village. There were a few cases of smallpox in a family near Phillipsburg, Ohio, (postoffice Center). All persons known to have been exposed to smallpox were excluded from our village for sixteen days, and the board of health had printed and distributed circulars urging all citizens to be vaccinated, and required (by proper resolution) all attending Milton schools to be vaccinated. Two hundred and seventy-five children are enrolled in the Milton schools and all but twenty-four have been vaccinated.

There were only six meetings of the board of health during the year.

Total amount spent during the year by the board of health was $86.

During the year there were no prosecutions brought by the board of health.

Infectious diseases reported during the year: Typhoid fever, 2 cases; measles, 1 case.

WEST UNION, ADAMS COUNTY.

Dr. W. K. Coleman, health officer.

Population (estimated), 1,200.

The board of health has not met for several years. There are no reports of any kind. The village is in need of sanitary regulations, and would suggest that a representative of the State Board be sent here in early spring and a reorganization be made.

WILLIAMSPORT, PICKAWAY COUNTY.

G. C. Hays, M. D., health officer.

Population (estimated), 600.

Our streets, lanes and alleys are in fine condition from a sanitary point of view. Our drainage is very good as our village has many natural advantages from its location on the bluff of Deer creek. We have no nuisances that have caused us trouble in their abatement. We have a dump far away from town, in an abandoned gravel pit, where we trench night-soil and deposit garbage, which work is done by a sanitary police, with consent of property owners, after due legal notice.

All contagious diseases are reported and immediately quarantined, and we have no trouble in enforcing our rules and regulations in any cases whatsoever. In the year just past we have been exceptionally free from any contagious or infectious diseases, while diphtheria and whooping cough have been near us in the country. We have taken no steps to vaccinate our school children, and I would judge that 25 per cent. have been vaccinated already.

Our board has regular monthly meetings, and the secretary keeps records of all proceedings and is paid a salary. Our board spent less than $100 last year. We have no trouble now in any way. We have a general clean-up once a year and sometimes twice without any prosecutions or ill-feelings from any one.

WILLOUGHBY, LAKE COUNTY.

George B. Durban, heath officer.

Population (estimated), 2,500.

No report.

Infectious diseases reported during the year: Scarlet fever, 3 cases; typhoid fever, 1 case; measles, 48 cases.

WILMINGTON, CLINTON COUNTY.

A. T. Quinn, M. D., health officer.

Population (estimated), 4,500.

I was appointed health officer May, 1898. I have no duties from which I can give a report except since I was appointed. The sanitation and drainage of town good. Nuisances have been abated without any difficulty. We have the night-soil and garbage hauled outside of corporation. Contagious diseases are generally reported. Record is not kept. The board always enforces proper restrictive measures. I am unable to give number children vaccinated. I think none. The board meets once a month and oftener if necessary. The council pays all the sanitary expenses, amounting to from $150 to $200. There have been prosecutions for not complying with health orders.

WINTON PLACE, HAMILTON COUNTY.

Dr. E. H. Johanning, health officer.

Population (estimated), 1,800.

Streets, alleys and yards are in a fairly good condition. There has been considerable complaint about filthy gutters, which is due to nothing else but lack of sewerage. There is no other nuisance which has not been successfully abated. Garbage, etc., is removed and taken to a dump several miles outside of corporation once a week, from May 1 to September 30, and once every two weeks, from September 30 to May 1.

Contagious diseases are reported properly. A record of such cases is kept.

The board has been able to enforce proper restrictive measures.

Scarlet fever has been more prevalent than usual.

There were about 150 persons vaccinated last year. In the schools there remain fifty-one children who have not been vaccinated.

The board meets once a month. Amount spent by the board in year 1898, $79.05.

There were no prosecutions.

Infectious diseases reported during the year: Scarlet fever, 7 cases.

WOODSFIELD, MONROE COUNTY.

A. S. Baker, health officer.

Population (estimated), 1,600.

Streets, alleys and yards are in a cleanly condition. There is no complaint from lack of sewerage or improper discharge of sewage. There are no nuisances which the board was unsuccessful in abating.

Contagious diseases are properly reported. No record of such is kept. The board has been able to enforce restrictive measures. Scarlet fever has been more prevalent than usual. There were no vaccinations during the year.

The board of health held four meetings during the year. Total amount spent by the board for the year, $50.

WOODSTOCK, CHAMPAIGN COUNTY.

Oliver Ewing, health officer.

Population (estimated), 500.

Sanitary condition good. Good drainage. All contagious diseases are reported.

Board of health met four times. It was not necessary to meet oftener.

Board of health expense, $5. Have no suggestions to make.

Infectious diseases reported during the year: Typhoid fever, 3 cases; chicken-pox, 30 cases.

WYOMING, HAMILTON COUNTY.

Geo. Stoddard, health officer.

Population (estimated), 1,800.

Our streets and alleys are in a cleanly condition, closely watched by board of health, especially during summer months. Sewer system good. Health officer has had 27 vaults cleaned during year. Night-soil taken out of village and buried according to rules.

All contagious diseases are properly reported and a complete record kept of the same, and the board has been able to enforce proper restrictive measures.

Have had an epidemic of the so-called "smallpox," 22 cases in all. Quarantined eight houses with 47 persons in them, keeping some in quarantine over three weeks, and succeded in preventing the disease from spreading and stamping it out in about four weeks. Gave *free vaccination* and made it compulsory in the part of village where disease was located.

Board of education, on recommendation of board of health, *compelled all pupils* to be vaccinated. Suppose 700 or 800 persons were vaccinated, perhaps more, it was general.

Board has held nine formal meetings Our expenses will be about $225. The village having its policeman to act as sanitary officer, under orders of the health officer, and also to perform guard duty on quarantining houses without expense to the health board. No suggestions to offer.

Infectious diseases reported during the year: Diphtheria 1 case; scarlet fever, 1 case; smallpox, 22 cases; measles, 1 case.

XENIA, GREENE COUNTY.

A. D. De Haven, M. D., health officer.

Population (estimated), 8,000.

Our board has maintained an active organization, and everything pertaining to the sanitary condition of the city has been properly and punctually carried out. Our sanitary condition, however, could be materially improved, providing we could have a sanitary system of sewerage.

Infectious diseases reported during the year: Diphtheria, 2 cases; scarlet fever, 1 case.

YOUNGSTOWN, MAHONING COUNTY.

H. E. Welch, M. D., health officer.

Population (estimated), 50,000.

No report.

Infectious diseases reported during the year: Diphtheria, 26 cases; scarlet fever, 34 cases; typhoid fever, 147 cases; whooping cough, 203 cases; measles, 30 cases.

ZANESVILLE, MUSKINGUM COUNTY.

Dr. H. T. Sutton, health officer.

Population (estimated), 30,000.

The streets, alleys and yards of our city are in good condition. There is some cause for complaint from lack of sewerage. The board has not failed to abate all nuisances which they have gone after. Night-soil and garbage are hauled outside of the city and properly taken care of.

All contagious diseases are properly reported and a record kept in board of health office. The board has enforced the necessary restrictive measures, and as a result have had very little contagious disease of any kind the past year. There have been very few vaccinated since 1896, when we had smallpox here. The superintendent of public schools reports 1,300 children not vaccinated.

The board held four meetings last year. Our expenses were about $1,900. No prosecutions last year, and have no suggestions as to improving the form or character of our board.

Infectious diseases reported during the year: Diphtheria, 2 cases; scarlet fever, 25 cases.

ANNUAL REPORTS OF TOWNSHIP BOARDS OF HEALTH.

The following list of questions was sent to each township board of health:

1. How many meetings has the board held during the year?
2. Give number and character of nuisances abated by the board?
3. How many cases of contagious disease were quarantined by the board?
4. Have attending physicians failed to report contagious diseases?
5. Has the board brought any prosecutions during the year?
6. If so, for what cause and with what result?
7. Give estimated number of persons in the township who were vaccinated during the year?
8. What amount of money was spent for board of health purposes?
9. What suggestions have you to offer for increasing the efficiency of township boards of health?

The replies, as well as the lack of replies, indicate that sanitary matters are still much neglected in the many rural districts. This is not true of all, for in some of the townships most excellent work is being done by the board of health.

The law creating boards of health in the townships, enacted in 1893, is as follows:

> "In each township the trustees of the township shall constitute a board of health, which shall be for the township outside the limits of any city or village, and such boards shall have the same duties and powers as are herein imposed upon or granted to boards of health in cities and villages. They shall annually elect one of their number president, and the township clerk shall be the clerk of the board of health; they may appoint a health officer and as many sanitary officers as they deem necessary to carry out the provisions of this act, and define their duties and fix their compensation; and such appointees shall serve during the pleasure of the board. Township boards of health shall meet annually and at such other times only as is actually necessary. (O. L. Vol. 91, p. 23.)

There are 1,357 townships in Ohio, and consequently that many boards of health; for the trustees under this law constitute a board of health in each township, whether they meet to organize or not.

Taking up the answers to the questions given above, there were 835 boards, or 61 per cent. of the total number that sent in replies.

Question 1. *Number of meetings held.*

Four hundred and sixty-five boards held meetings during the year. This is 56 per cent. of the number reporting, showing a great neglect of the law requiring these boards to meet annually.

Question 2. *Nuisances abated.*

There were 448 nuisances abated by 131 different township boards. Owing to the comparatively sparse settlement of our rural districts we do not expect to find there many nuisances detrimental to health or comfort.

Question 3. *Contagious diseases quarantined.*

Contagious diseases are reported in 339 of the 835 townships from which reports were received. It is altogether improbable that these other townships that reported—nearly 500 in number—were free from contagious diseases during the year. In 114 of the 835 reporting it is stated that physicians made no reports. Three hundred and thirteen of the 339 boards that reported the presence of contagious disease, enforced a more or less perfect quarantine.

The total number of cases of contagious diseases quarantined in the 339 townships reporting such diseases, was 1,735.

The contagious diseases reported were as follows:

Diphtheria	686
Membranous croup	100
Scarlet fever	653
Typhoid fever	587
Smallpox	208
Whooping cough	529
Measles	1,576
Other contagious diseases	139

Question 5. *Prosecutions.*

Seven boards brought each one prosecution for violation of the health laws. Of these suits five were won and two were pending at the time of the report.

Question 7. *Vaccination.*

In only 84 townships were there reports of vaccination having been performed. The number of persons estimated to have been vaccinated in the 84 townships was 10,016.

Question 8. *Expenses.*

In but 276 of the 835 townships reporting was any money spent for board of health purposes. The aggregate amount was $12,093. This is an average of about $43 for each township.

These reports are somewhat discouraging. There are several causes for the neglect or failure of township boards of health to properly perform their duties. First, such boards are composed of men who have paid but little attention to sanitary matters. The membership of these boards is subject to too frequent changes. The members are generally unwilling to pay a sufficient sum to secure the services of a person for health officer, properly qualified to advise and assist them, and to carry out their orders. While we could wish for a greatly better showing for our rural boards of health, we should not lose sight of the fact that six years ago there was practically no protection against communicable diseases or injurious nuisances in rural districts, and no boards of health for the enforcement of health laws outside of cities and villages.

Abstract of Reports

OF

Deaths and Their Causes

IN THE FOLLOWING

Cities, Towns and Townships in Ohio

FOR THE

Year Ending December 31, 1898.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF JANUARY, 1898.

Cities of 10,000 inhabitants (census of 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Canton	48,071	27	6 55	6	2	3	....	....	....	....	....	....	....	....	....	....	....	2	1	4	1	3	6	....	....	....	1	1	2	....	....	2	14	....	....
Chillicothe	11,575	11	11.40	....	....	2	....	....	....	....	....	1	....	....	....	....	....	1	....	1	....	....	5	1	....	....	....	....	....	....	....	....	3	....	1
Cincinnati	405,000	500	14.81	64	58	61	13	....	....	....	....	2	....	....	....	4	1	8	9	103	27	61	287	14	8	31	8	13	20	15	....	84	32	17	59
Cleveland	370,000	316	10.25	65	30	40	17	1	....	....	....	....	....	....	....	1	....	6	1	60	13	12	159	6	5	5	18	5	18	13	....	42	40	14	43
Columbus	135,187	123	10.92	11	7	9	2	....	....	....	....	....	....	....	....	....	....	2	....	34	6	24	60	7	9	2	4	4	5	1	2	12	11	7	12
Dayton	88,394	86	10.65	13	5	7	....	....	1	....	....	....	1		....	....	....	....	....	17	4	8	52	1	....	2	2	4	2	1	....	12	5	5	7
*East Liverpool	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Findlay	20,000	10	6.00	....	....	2	1	1	....	....	....	....	....	....	....	....	....	....	....	2	....	2	5	1	1	1	....	....	....	....	....	....	1	1	2
Hamilton	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ironton	12,952	17	15.75	4	1	....	.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	1	1	2	1	2	....	1	....	1	8	..	....
Lima	29,058	28	11.96	6	2	4	4	....	....	....	....	....	....	....	....	....	....	....	....	6	3	3	10	....	1	....	1	....	5	....	....	3	5	2	3
Mansfield	17,296	23	15 96	2	1	5	....	....	1	....	....	....	....	....	....	....	....	....	....	4	....	3	14	4	1	....	....	....	4	....	....	1	....	....	....
*Massillon	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Newark	19,594	30	18 37	....	2	7	....	....	....	....	....	....	....	....	....	....	....	2	1	4	1	3	15	....	4	....	....	1	5	2	....	3	2	2	1
Portsmouth	13,325	21	18.91	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	4	7	....	....	1	....	2	2	1	....	1	6	1	....
Sandusky	20,885	18	10 34	2	2	4	2	....	....	.	....	....	....	....	....	....	....	1	....	1	....	1	5	....	1	....	....	1	1	....	....	1	8	....	....
Springfield	45,020	39	10.39	10	5	6	2	....	1	....	....	....	....	2	....	....	....	.	....	3	....	3	26	4	3	6	1	1	4	1	....	2	4	....	2
*Steubenville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Tiffin	13,900	11	9.50	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	6	....	1	1		1	1	....	....	2	2	2	....
Toledo	120,036	116	11.60	23	11	19	3	.	3	....	....	1	1	....	....	....	....	3	1	19	5	12	46	....	2	3	5	2	11	1	....	10	20	7	20
Youngstown	61 333	40	7.83	4	4	5	....	....	....	....	....	....	....	....	....	....	....	3	1	6	2	4	19	1	....	4	....	....	3	2	....	7	3	5	7
*Zanesville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	..	....
Totals	1,431,629	1,416	11 87	211	131	174	44	2	6	..	...	4	2	2	...	5	1	28	14	269	62	144	731	40	37	58	41	37	83	38	2	183	164	63	157

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF JANUARY, 1898.

Cities of less than 10,000 inhabitants (census of 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever	Whooping cough.	Total constitutional diseases	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	7	7 43	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	1	...	...	1	...	1	1	...	2	...	...	...
Bellaire	11,783	13	13.24	1	1	5	1	...	...	...	1	1	...	...	...	1	...	...	...	6	1	1	2	...	1	...	...	...	...	1	...	...	...	...	3
Bucyrus	8,516	2	2 80	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...	...	1	...	...	...	...	...	...
Circleville	7,366	6	9 77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	...	4	1	...	...	...	...	...	...	...	...	...	...	...
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	13	16.47	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	10	3	1	...	1	...	3	1	...	1	1	...	...
Fostoria	12,215	7	6.90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	1	...	...	...	2	...	...	...	...	1	...
Fremont	6.236	5	9 62	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	1	...	...	...	...	...	...	...	...	...	2	...
Galion	6,939	7	12.11	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	3	...	...	...	...	1	1	1	...	...	1	...	...
*GaLipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenville	7,815	4	6.01	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...
Kenton	7,340	6	9 81	...	...	2	1	...	...	...	1	...	...	...	...	...	...	...	...	1	...	1	2	...	1	...	...	...	1	...	...	...	...	1	...
Lancaster	8,215	7	10.22	...	...	4	...	...	...	...	2	...	...	...	...	...	...	1	...	1	...	1	2	1	...	...	...	...	1	...	...	...	...	...	...
Marietta	11,588	13	13.46	1	2	3	1	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	7	...	2	...	...	...	1	1	...	1	2	...	...
Marion	15,280	8	6 26	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	1	...	4	...	...	1	...	...	...	...	...	...	1	...	...
Martin's Ferry	9,268	5	6.47	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	3	1	...	...	...	...	1	...	...	...	...	...	2
Middletown	11,702	9	9.23	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	7	2	1	...	...	...	3	1	...	...	...	...	...
Mt. Vernon	6,731	12	21.39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	2	7	1	1	1	...	...	...	...	...	1	1	...	...
Norwalk	8,663	13	18.00	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	5	1	4	6	2	1	...	...	...	2	...	...	1	...	1	1
Piqua	12,620	12	11.40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	3	2	5	...	1	...	...	...	1	1	...	1	2	...	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	13	20.27	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	7	1	1	1	1	...	2	1	...	...	2	2	...
Troy	5.136	5	11.68	...	1	1	...	...	...	...	...	...	...	1	...	...	...	...	...	2	...	2	2	...	...	...	...	...	1	...	...	...	...	...	1
Urbana	6.723	13	23.20	2	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	4	...	3	7	...	...	...	...	...	4	1	...	2	1	...	1
Warren	8,320	4	5 77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	2	...	1	...	...	...	...	...	...	...	...	...	...
Washington C. H.	7,992	6	9.09	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	2	...	...	...	...	...	1	...	...	...	...	...	...
Wellston	8,000	18	27.00	3	1	8	2	...	...	...	...	2	2	...	...	...	...	...	...	...	...	...	7	...	1	...	1	...	3	...	...	2	...	3	...
Wellsville	7,464	8	12.89	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	3	5	...	2	...	...	...	...	...	1	2	...	...	...
Wooster	5,950	7	14.12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	6	1	1	...	...	1	...	...	...	3	...	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	230,331	223	11.62	14	12	31	7	...	...	...	4	3	2	1	...	1	...	3	...	50	12	31	117	15	17	3	4	2	29	9	1	16	11	10	8

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF FEBRUARY, 1898.

Cities of 10,000 inhabitants (census of 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canton	48,071	23	5 66	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	9	2	3	...	...	...	3	...	...	1	11	...	...
Chillicothe	11,575	18	18 65	...	...	3	1	...	...	...	...	...	...	...	...	...	...	2	...	4	...	...	5	...	...	...	...	1	...	1	...	...	4	2	...
Cincinnati	405,000	413	12.24	60	43	36	9	...	...	...	...	...	...	...	2	...	...	9	7	98	12	62	248	9	2	32	15	11	31	10	2	53	14	17	30
Cleveland	370,000	337	10.91	65	36	34	9	1	...	1	...	1	...	1	...	3	...	8	...	61	20	17	184	5	5	13	24	19	15	16	3	40	46	10	41
Columbus	135,187	136	12.14	18	8	8	...	...	...	...	2	...	...	3	...	1	...	1	...	28	6	21	77	13	10	...	4	3	10	4	...	23	15	8	4
Dayton	88,394	92	12.19	11	8	7	3	...	3	...	...	...	...	...	...	1		...	...	19	4	9	57	2	...	3	4	2	9	2	...	10	7	2	11
*East Liverpool	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Findlay	20,000	18	10.22	3	1	2	...	1	...	...	...	...	...	...	...	1	...	...	...	1	...	...	13	1	...	1	...	...	3	1	...	3	1	1	2
*Hamilton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ironton	12,952	23	21.31	3	1	4	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...	2	10	1	...	1	...	2	1	...	...	5	6	1	...
Lima	29,058	24	10.30	1	1	4	4	...	...	...	...	...	...	...	...	...	...	...	...	7	1	6	7	1	...	1	1	...	1	...	...	3	5	1	4
Mansfield	17,296	23	15 96	3	2	5	1	...	2	...	...	...	...	...	...	...	...	2	...	1	...	1	12	4	...	...	1	1	2	...	...	2	2	2	...
*Massillon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Newark	19,594	17	11.60	2	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	3	1	2	11	4	1	...	1	...	...	...	...	5	1	1	5
Portsmouth	13 325	20	17.13	5	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	13	...	...	...	2	...	3	...	...	5	...	1	1
Sandusky	20,888	15	8.14	3	2	2	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1	6	1	...	...	...	...	1	1	...	3	6	...	...
Springfield	45,020	35	9.07	6	4	1	...	...	...	...	1	...	...	...	...	...	...	...	...	11	1	7	19	2	2	2	3	1	4	2	...	3	3	1	3
*Steubenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13 900	11	9 50	1	...		...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	6	...	1	...	...	...	4	...	...	1	1	1	...
Toledo	120,036	107	10.61	21	8	9	1	1	2	...	...	...	...	1	...	...	...	...	...	18	4	11	53	1	3	7	5	1	9	...	...	12	20	7	19
Youngstown	61,333	43	8.41	12	7	4	...	...	...	...	...	...	...	...	...	...	...	2	2	5	1	4	30	1	1	9	2	...	1	2	...	12	1	2	7
*Zanesville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	1,431,629	1,355	11.36	216	123	122	30	3	7	1	3	1	...	5	2	6	...	29	10	263	53	144	760	47	28	69	62	41	97	39	5	181	143	57	130

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF FEBRUARY, 1898.

Cities of less than 10,000 inhabitants (census of 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1.000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and Peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	2	2.12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	2	...	...	...
Bellaire	11,783	16	16.30	4	3	4	1	...	...	...	...	...	...	...	...	...	...	1	...	2	1	1	5	...	...	...	1	1	...	...	...	3	4	1	...
Bucyrus	8,516	8	11.27	...	...	2	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	1	5	...	1	...	...	1	2	...	1	...	...	...	...
Circleville	7,366	11	17.92	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	1	8	...	...	...	...	1	1	...	...	1	...	...	2
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	1	1.27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	1
Fostoria	12,215	13	12.27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	11	1	2	...	...	1	6	...	...	1	...	...	...
Fremont	6,236	8	15 40	...	...	2	...	...	...	...	...	...	...	...	...	...	...	1	...	3	...	3	1	...	...	...	...	1	...	...	...	...	2	...	...
Galion	6,939	5	8.65	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	3	1	...	...	...	...	1	...	...	1	1	...	...
*Gallipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenville	7,815	6	9.21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	1	...	1	3	...	...	...	...	...	2
Kenton	7 340	6	9.81	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	2	...	...	...	...	...	...	...	...	1	...	...	...
Lancaster	8 215	12	17.53	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	4	2	2	6	...	...	...	...	2	1	1	...	2	...	...	1
Marietta	11,588	13	13.46	3	1	3	1	...	...	...	...	...	...	...	...	...	...	...	1	5	1	4	5	1	...	1	...	2	...	...	...	...	...	...	...
Marion	15,280	7	5.50	1	...	3	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	2	...	1	...
Martin's Ferry	9 268	11	14.24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	1	...	1	...	1	2	...	...	3	...	...	...
Middletown	11,702	7	7 18	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	5	...	1	...	...	...	1	1	...	2	...	1	...
Mt. Vernon	6,731	5	8.91	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	3	...	...	1	...	...	...	...	...	1	...	1	...
Norwalk	8.663	13	18 00	1	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	4	1	3	8	3	...	...	...	1	4	...	...	...	...	...	...
Piqua	12,620	8	7.60	...	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	4	...	...	...	...	...	3	...	...	1	1	...	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	6	9.35	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	5	...	1	...	...	...	2	...	...	2	...	...	1
Troy	5,136	6	14.02	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	1	...	...	...	...	...	1	...	1	1
Urbana	6,723	9	16.64	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	6	1	1	1	...	...	2	...	...	...	1	1	1
Warren	8,320	8	11.54	...	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	5	...	...	...	...	...	...	...	...	2	...	...	...
Washington C. H.	7,992	7	10.51	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	3	...	...
Wellston	8,000	3	4.50	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	1	...	...	1
Wellsville	7.464	3	4 82	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	2	...	...	...	...	...	2	...	...	...	...	...	...
Wooster	5,950	15	30.25	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	10	1	2	...	1	3	...	...	...	...	2	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	230,334	209	10.89	15	9	24	4	...	2	...	1	...	...	...	...	...	...	2	1	39	9	26	123	9	9	6	2	15	31	2	1	26	14	6	10

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF MARCH, 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total number under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhoeal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	.	....	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....
Canton	48,071	28	6.58	6	4	2	....	....	....	...	...	...	...	...	...	...	...	2	...	4	1	3	11	....	....	...	1	1	4	2	....	3	11	....	....
Chillicothe	11,575	24	24.88	....	...	1	....	....	....	...	...	...	...	...	...	...	...	...	...	4	2	1	14	1	2	....	....	1	3	2	....	2	....	5	..
Cincinnati	405,000	527	15 60	77	68	53	6	....	3	...	2	2	...	3	1	2	1	8	12	109	16	66	313	13	5	31	16	15	30	30	2	71	32	20	53
Cleveland	370,000	486	15 76	123	55	39	9	....	2	..	...	...	...	6	...	1	...	3	1	81	10	23	283	8	12	23	51	15	32	21	2	61	61	13	50
Columbus	135,187	142	12 60	28	13	10	1	....	....	...	2	...	...	4	...	...	...	1	1	45	11	20	67	7	7	4	6	3	5	8	....	14	14	8	12
Dayton	88,394	92	12.49	....	....	14	1	....	3	...	...	...	...	8	...	...	...	...	..	21	8	13	51	2	....	1	3	3	6	1	....	12	13	3	....
*East Liverpool	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Findlay	20,000	16	9.60	...	1	....	....	....	....	...	..	...	...	...	...	...	...	...	...	8	2	5	7	....	2	....		....	1	....	....	....	....	1	4
*Hamilton	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	.	....	....	....	....	....
Ironton	12,952	17	15.75	4	1	3	....	....	....	...	...	...	...	...	...	...	...	3	...	7	1	6	4	....	1	1	....	....	....	1	....	1	3	....	....
Lima	29,058	19	8 24	5	2	....	....	....	....	...	...	...	...	...	...	..	...	...	...	1	...	1	10	1	1	....	....	....	4	1	....	2	6	2	2
Mansfield	17,296	14	9 15	2	2	3	1	....	1	...	...	...	...	...	...	...	...	1	...	3	2	1	4	...	....	....	....	1	....	....	....	1	1	8	3
*Massillon	....	....	....	...	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	..	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....
Newark	19,594	24	14 72	1	3	3	1	....	1	...	...	...	..	..	...	...	...	...	...	2	....	2	13	...	1	1	...	....	3	2	1	5	1	5	2
Portsmouth	13,325	22	18.94	...		3	....	....	....	...	...	1	1	...	...	...	...	1	...	3	....	2	14	....	....	2	....	....	2	1	....	7	2	....	....
Sandusky	20,888	16	10.27	2	2	4	1	....	....	...	...	...	...	...	...	...	...	2	1	3	2	1	6	....	2	....	....	....	2	1	....	1	3	....	1
Springfield	45,020	46	12.26	6	3	3	....	....	....	...	...	...	...	...	1	1	...	1	...	7	1	3	29	1	4	2	....	1	3	2	....	8	3	4	2
*Steubenville	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	..	.	...	....	....	....	....	....	....	....	....	....	....	...	....	....
Tiffin	13,900	16	13.80	....		1	....	....	....	...	...	...	...	...	...	..	...	...	...	5	1	3	8	....	2	....	.	....	2	2	....	1	....	2	1
Toledo	120,036	131	13.25	33	6	15	....	....	3	...	...	...	...	...	...	...	...	5	1	18	3	9	72	1	1	3	11	1	9	3	....	20	18	5	12
Youngstown	61,333	64	12.86	18	6	6	1	....	....	...	...	...	...	...	...	...	...	3	...	11	4	5	41	1	1	4	3	....	4	1	....	19	4	2	2
*Zanesville	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....		....	....	....	....	....	....	....	....	.	....	....	....	....	....
Totals	1,431,629	1,681	14 12	305	166	160	21	....	13	...	4	3	1	21	2	4	1	30	16	332	69	174	947	39	41	72	91	41	110	81	5	228	172	68	144

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF MARCH, 1898.

Cities of less than 10,000 inhabitants. (census 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1 000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	11	11 68	1	2	1	...	...	1	...	...	...	...	...	...	...	...	...	...	3	1	2	5	...	...	...	...	...	1	...	...	4	2	...	...
Bellaire	11,783	17	17.31	2	3	4	...	...	...	...	3	...	...	...	...	...	...	1	...	2	...	1	10	1	1	...	...	1	...	2	...	5	1	...	...
Bucyrus	8,516	10	14.10	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	9	2	1	...	...	...	3	...	1	2	...	...	1
Circleville	7,366	12	19.54	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	2	9	...	...	...	...	1	1	...	...	5	...	...	...
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	10	12.67	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...	2	4	1	...	1	...	...	2	...	...	...	3	...	...
Fostoria	12,215	5	4.91	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	2	...	...	1	...	...	...	...	...	...	...	...	1
Fremont	6,236	7	13.47	...	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	2	...	2	2	...	1	...	...	...	...	1	...	...	2	...	...
Galion	6,939	2	3.46	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	1
*Gallipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenville	7,815	9	13.82	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	7	...	...	...	...	...	3	1	...	...	...	...	...
Kenton	7,340	8	13.08	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	3	...	1	...	...	...	2	...	...	...	...	1	...
Lancaster	8,215	11	16.68	1	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	3	1	2	5	1	...	...	1	1	1	...	...	...	...	2	...
Marietta	11.588	10	10.36	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	5	...	...	...	...	1	1	1	...	1	1	2	1
Marion	15,280	9	7.68	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	4	1	...	2	...	...	...	...	...	1	1	...	...	...	2	2
*Martin's Ferry	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Middletown	11,702	9	9 23	1	2	2	...	...	...	...	...	...	...	2	...	...	...	...	...	1	1	...	6	1	1	...	...	1	...	...	...	3	...	...	...
Mt Vernon	6,731	6	11.44	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	4	3	...	...	...	...	1	...	...	...	1	...	...
Norwalk	8,663	7	9.69	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	5	2	...	...	...	3	...	...	...	...	...	...	1
Piqua	12,620	9	8.56	2	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	7	...	...	...	...	...	5	1	...	...	...	...	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	5	7.81	2	...	2	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	2	...	...	...
*Troy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Urbana	6,723	11	19.63	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	6	1	...	1	1	...	2	...	1	...	1	2	...
Warren	8.320	7	10 09	2	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	2	...	1	1	...	...	...	...	...	...	...	...	...	3	...	1
Washington C. H	7,992	7	10.51	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	1	4	...	...	...	...	...	...	...	...	...	...	...	1	...
Wellston	8,000	10	15.00	2	3	2	...	...	...	...	...	...	1	...	...	...	...	...	...	2	1	1	6	...	...	...	1	...	...	1	1	3	...	...	...
Wellsville	7,464	13	20.90	...	...	3	...	...	...	...	...	...	...	...	...	...	...	2	...	3	1	2	4	...	...	1	1	...	...	...	...	...	...	3	1
Wooster	5,950	8	16.14	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	5	...	...	1	...	...	2	...	...	2	...	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	215,930	213	11.84	22	14	25	1	1	4	...	4	...	1	2	1	...	...	4	1	51	11	32	110	12	5	5	4	8	25	8	3	27	14	13	9

*No report received.

Abstract of the Reports of Deaths, and Their Causes, in the Following Cities of Ohio, During the Month of April, 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhoeal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Permature and still-births.
*Akron																																			
Canton	48,071	23	5.66	6	2	3												3		2	1		10	1		1	2		2	1		3	7	1	
Chillicothe	11,575	18	18 65			1												1		4	1	1	10						2			2		1	5
Cincinnati	405,000	513	15.20	98	53	46	6	2	2			2						4	18	107	14	66	304	18	13	32	15	7	37	22	2	70	33	23	41
Cleveland	370,000	441	11.60	121	56	38	9	1	6			1		2				5	1	67	14	22	245	9	4	22	29	14	24	34	1	61	62	12	42
Columbus	135,187	165	14.78	19	15	14					1			7				2	2	31	4	23	94	15	5	3	6	1	9	10		25	15	6	9
Dayton	88,394	108	14.66			10	1				1			4					2	22		14	55	1	4	1	2		4	3		13	16	5	
*East Liverpool																																			
Findlay	20,000	22	13 20	3	2	1										1				10	3	6	10						2	1		1	1		4
*Hamilton																																			
Ironton	12,952	14	12.97	4	2	1					1												6			1	1		3			1	5	2	
Lima	29,058	30	12.39	4	5	6	3		2											8	2	5	6	1		1	1					3	8	2	2
Mansfield	17,296	14	9.15		2	1										1				3		1	8	1	1			1	1					3	2
*Massillon																																			
Newark	19,594	9	5.51			1														1		1	5	1				1	1				1	1	2
Portsmouth	13,325	18	16.21			1	1													2		2	7						1			4	6	2	
Sandusky	20,888	33	18.96	9	3	5	1						1		2			1		5	2	3	11			1			3	4		3	10		2
Springfield	45,020	36	9.10	2	3	3			1											11	1	9	16	3		2	1	1	7			1	2	3	5
*Steubenville																																			
Tiffin	13,900	11	9.50																	1		1	5				1		3			1	4	1	
Toledo	120,0[illegible]6	155	15.49	36	16	24	2		2				1							19	4	12	87	3	5	8	7	3	12	2		19	19	7	15
Youngstown	61,333	34	6.49	6	3	6												3	3	5	1	3	19			3			3	2		6	2	2	4
*Zanesville																																			
Totals	1,431,629	1,644	13.78	308	162	161	23	3	13	...	3	3	2	13	2	2	...	19	26	298	47	169	898	53	32	75	65	28	114	79	3	213	191	71	133

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF APRIL, 1898

Cities of less than 10,000 inhabitants (census of 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's diseases.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	4	4.25	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	2	...	...	...	...	...	...	...	...	1	...	...	1
Bellaire	11,783	14	14.26	...	...	3	1	...	...	...	1	...	...	...	...	...	...	1	...	6	...	4	5	1	...	...	...	...	1	...	...	3	...	...	2
Bucyrus	8,516	7	9.87	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	4	1	1	...	...	...	2	...	...	...	...	1	...
Circleville	7,366	12	19.54	1	1	2	...	...	...	...	...	...	...	2	...	...	...	...	...	1	...	...	9	...	...	...	...	...	3	...	...	2	...	...	1
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	5	6.34	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	3	...	...
Fostoria	12,215	10	9.82	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	7	...	1	...	...	1	1	...	...	1	...	1	2
Fremont	6,236	6	11.54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	3	1	...	...	...	...	1	1	...	...	1	1	...
Galion	6,939	3	5.19	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	2	...	...	...	...	1	...
*Gallipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenville	7,815	6	9.21	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	5	...	...	...	...	...	3	1	...	...	...	...	1
Kenton	7,340	3	4.90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	...	...	...	...	...	...	...	...	...	...	...	1	...
Lancaster	8,215	14	20.44	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	3	9	...	2	...	...	...	1	3	...	3	2	...	...
Marietta	11,588	7	7.25	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	2	2	...	4	...	...	1	...	...	...	...	...	2	...	...	...
Marion	15,280	13	10.21	...	...	2	...	...	...	...	...	...	...	...	...	...	...	1	...	4	1	...	7	...	2	...	...	...	2	...	...	2	...	...	...
*Martin's Ferry	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Middletown	11,702	13	13.33	...	4	1	...	...	...	...	...	...	...	1	...	...	...	...	...	4	1	3	7	...	1	...	...	1	1	...	...	...	...	1	...
Mt. Vernon	6,731	6	11.41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	4	...	...	...	1	1	1	...	...	...	1	...	...
Norwalk	8,663	4	5.56	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	2	...	...	...	...	...	...	...	1	...	...	...
Piqua	12,620	14	13.31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	10	1	...	...	...	1	5	...	...	2	...	...	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	6	9.36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	3	...	...	...	...	...	1	...	...	2	1	...	...
*Troy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Urbana	6,723	7	12.50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	5	1	...	...	...	...	2	...	...	1	1	...	...
Warren	8,320	11	15.87	4	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	9	...	...	1	...	...	2	...	...	3	1	1	...
Washington C. H.	7,992	12	18.18	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	9	...	...	...	...	...	3	...	...	2	...	...	...
Wellston	8,000	7	10.50	4	1	2	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	1	2	1	...	1
Wellsville	7,464	1	1.61	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...
Wooster	5,950	9	18.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	1	6	...	1	...	1	...	3	1	...	...	...	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	215,930	194	10.78	18	11	13	2	...	1	...	1	...	...	3	...	...	...	3	...	43	6	27	118	7	8	2	3	4	34	6	1	27	11	7	8

No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF MAY, 1898.

Cities of 10,000 inhabitants (census of 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pnuemonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Canton	48,071	33	8.24	8	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1	1	11	1	1	....	1	....	....	1	....	7	18	2	....
Chillicothe	11,575	20	20.73	....	....	3	1	....	.	....	1	....	....	....	....	....	....	1	....	8	....	1	6	1	2	....	1	....	....	1	....	2	1	....	1
Cincinnati	405,000	477	14.13	96	47	48	3	....	4	....	2	3	....	3	....	....	....	8	7	92	23	48	271	16	7	33	11	12	27	22	....	44	36	30	34
Cleveland	370,000	447	14 47	100	42	40	5	1	6	1	1	1	....	2	....	2	....	10	1	62	12	18	252	7	7	13	35	12	31	18	2	67	60	28	34
Columbus	135,187	139	12 34	11	10	14	1	....	....	....	1	....	....	2	....	....	....	6	4	23	9	14	86	9	5	3	3	9	11	6	....	19	10	4	9
Dayton	88,394	92	12.49	....	....	7	....	....	....	....	....	....	1	....	....	....	....	1	....	18	4	10	57	....	2	2	2	5	3	6	....	13	7	2	....
*East Liverpool	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Findlay	20,000	14	8.40	....	2	2	....	....	....	....	....	....	....	....	....	2	....	....	....	4	1	2	6	....	1	....	1	....	3	....	....	....	1	1	2
*Hamilton	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ironton	12,952	19	17.60	1	....	15	1	1	....	....	....	1	....	2	....	....	....	10	....	....	....	....	2	....	....	....	....	1	1	....	....	....	....	2	....
Lima	29,058	18	7.43	5	....	1	.	....	....	....	....	....	....	....	....	....	....	....	....	7	2	5	4	....	....	....	....	....	1	1	....	2	5	1	3
Mansfield	17,296	20	13.87	3	....	2	1	....	....	....	....	....	....	....	....	....	....	....	1	2	1	1	9	1	....	....	....	....	5	....	....	1	5	2	....
*Massillon	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Newark	19,594	11	6.74	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	2	2	4	1	1	....	....	....	1	....	....	1	....	3	1
Portsmouth	13,325	19	17.11	3	3	2	....	1	....	....	....	....	....	....	....	....	....	1	....	2	1	1	4	....	....	....	1	1	....	....	....	2	....	....	2
Sandusky	20,888	12	6.89	1	....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	2	1	1	4	....	....	1	....	1	2	....	....	....	5	....	....
Springfield	45,020	34	9.07	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8	2	6	21	4	2	....	1	1	7	2	1	1	3	2	4
*Steubenville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Tiffin	13,900	15	12.95	5	1	3	....	....	1	....	....	....	....	....	....	....	....	....	....	1	1	....	10	....	....	....	1	3	2	1	....	2	1	....	2
Toledo	120,036	122	12.19	19	11	10	1	....	3	....	....	....	....	....	....	....	....	....	....	17	5	9	64	2	3	4	7	4	5	2	....	13	17	14	12
Youngstown	61,333	43	8.41	9	....	2	....	....	....	....	....	1	.	....	....	....	....	1	....	8	2	3	24	2	....	2	3	3	2	....	....	4	6	3	8
*Zanesville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	1,431,629	1,535	12.87	265	119	150	13	3	14	1	5	6	1	9	....	4	....	39	13	260	67	122	835	44	31	58	67	52	101	60	3	178	175	94	112

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF MAY, 1898.

Cities of less than 10,000 inhabitants (census of 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhoeal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	6	6.36	1		1					1												4				1					2	1		
Bellaire	11,783	10	10.18	3	3	1		1												3		3	4		2			1				1		2	
Bucyrus	8,516	4	5.69																	1		1	3						1	1		1			1
Circleville	7,366	8	13.03		1															1			6	1	1				1	1		1		1	1
*Defiance																																			
Delaware	9,470	6	7 60			1						1								3			2												
Fostoria	12,215	4	3.93	1																2		2	2	1			1								
Fremont	6,236	6	11.54	1		1	1																2	1						1			2	1	
Galion	6,939	3	5.19	1	1																		3									3			
*Gallipolis																																			
Greenville	7,815	2	3.07	1																			2						2						3
Kenton	7,340	4	6.54																	1		1	1										2		
Lancaster	8,215	13	18.90	1	1	2														3	1	2	7		2	1		1	1	1		1	1		
Marietta	11,588	7	7.25	2	1															2		2	3				1		1			1	2		
Marion	15,280	8	6.26			2														1			2	1					1				2	1	
*Martin's Ferry																																			
Middletown	11,702	11	11.28	2	2	1								1						3		2	7	2				2		1		2			
Mt. Vernon	6,731	7	12.50																	1	1		6	1				1	1			2			1
Norwalk	8,663	3	4.16																	1	1		2		1				1						
Piqua	12,620	6	5.70		1	1																	5	1					3	1					
*Pomeroy																																			
Salem	7,696	5	7.81			1														1	1		3	1					1						
Troy	5,136	2	4.67																				2	1					1						1
Urbana	6,723	12	21.42			1			1											4	1	2	6				1	1	1	1					
Warren	8,320	6	8.65	1																1		1	5		1	1	1		1						
Washington C. H.	7,992	6	9.09	1																5		5												1	
Wellston	8,000	12	18.00			3			1	1		1											3		2		1						6		
Wellsville	7,464	15	30.25			5		1	1		1												9	2	2	1	1			1				1	1
*Wooster																																			
*Xenia																																			
Totals	215,116	166	9.21	15	10	20	1	2	3	1	2	2	...	1	...	...	...	.....	.....	33	5	21	89	12	11	3	7	6	16	8	.....	14	16	7	8

*No report received.

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Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrheal diseases.	Dysentery.	Malarial fever	Measles.	Puerperal fever.	Scarlet fever	Tonsillitis	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canton	48.071	17	4 25	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	2	5	...	2	...	...	...	1	2	...	...	7	1	...
Chillicothe	11,575	19	19.69	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	5	1	2	10	...	...	...	...	1	1	3	...	...	3	...	...
Cincinnati	405,000	397	11.76	76	50	45	3	13	2	1	1	3	...	2	1	1	...	8	5	70	10	41	212	11	4	15	10	13	28	18	...	34	39	35	41
Cleveland	370,000	403	13.07	98	50	45	4	10	2	1	2	1	...	...	...	...	...	11	6	49	6	14	214	5	2	10	26	17	24	22	1	52	63	26	55
Columbus	135.187	100	8.88	16	6	16	...	4	...	...	...	...	1	2	...	...	...	4	3	23	5	17	46	1	6	1	3	4	9	6	1	7	6	8	10
Dayton	88,394	68	9.23	...	...	9	...	1	2	...	...	...	...	...	...	...	...	1	1	19	7	10	26	1	2	1	1	...	2	...	...	2	5	7	...
*East Liverpool	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Findlay	20,000	16	9.60	3	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	11	...	1	...	1	...	5	...	...	1	1	2	5
*Hamilton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ironton	12,952	23	21.31	6	2	6	...	3	3	...	...	...	...	...	...	...	...	...	...	3	...	3	14	1	...	...	...	...	1	...	...	1	...	...	...
Lima	29,058	21	8 67	2	4	3	1	1	1	...	...	...	...	...	...	...	...	...	...	2	1	1	4	...	...	...	1	1	1	...	...	1	9	2	2
Mansfield	17.296	14	9.15	4	1	2	...	1	...	...	...	...	...	...	1	...	...	...	...	1	...	...	9	3	1	...	...	2	1	...	...	...	1	1	...
*Massillon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Newark	19,594	14	8.57	3	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	5	3	2	4	1	1	...	...	...	2	...	...	...	3	1	2
Portsmouth	13 325	15	13 51	...	...	4	1	1	...	...	1	...	...	...	...	...	...	1	...	3	1	2	7	...	...	1	...	1	1	...	1	1	...	1	...
Sandusky	20,888	18	10.34	1	1	5	...	1	...	...	...	...	1	...	...	...	...	3	...	1	...	...	4	...	...	...	...	1	2	...	...	1	7	...	...
Springfield	45,020	26	6 93	1	2	2	...	...	...	...	...	...	...	...	...	1	...	...	...	5	1	4	14	1	3	1	...	1	1	1	...	2	4	1	4
*Steubenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13,900	9	7 77	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	3	...	...	...	1	...	2	...	...	...	2	1	...
Toledo	120.036	96	9.60	23	9	12	...	2	3	2	...	...	...	...	1	...	...	1	...	20	5	12	45	2	4	3	7	5	2	3	...	4	15	4	17
Youngstown	61,333	33	6.46	6	4	4	...	...	...	...	...	...	...	...	...	...	...	4	...	5	2	3	12	...	...	1	1	1	2	...	...	1	9	3	5
*Zanesville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals.	1,431,629	1,289	10.80	241	133	157	11	37	13	4	4	4	2	4	3	2	..	29	15	217	43	116	640	26	26	33	51	47	85	55	3	107	174	93	141

* No report received.

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Alliance	11,306	9	9.55	....	1	2	....	....	....	...	.	...	...	...	...	...	...	1	...	2	1	....	4	....	1	....	1	1	....	....	....	....	1	...	....
Bellaire	11,783	16	16.30	3	2	2	....	....	....	...	...	..	...	...	...	...	...	2	...	2	....	2	5	2	....	....	1	1	1	....	....	....	4	2	1
Bucyrus	8,516	4	5.60	....	....	1	....	....	....	...	...	...	1	...	...	...	...	...	...	2	....	2	1	....	....	....	....	....	1	....	....	....	....	....	....
Circleville	7,366	10	16.29	2	....	1	....	....	....	...	...	...	...	...	...	...	...	1	...	3	....	...	5	2	....	....	....	...	....	1	....	....	....	1	....
*Defiance	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Delaware	9,470	14	17.74	....	....	1	....	....	1	...	...	...	...	...	...	...	...	...	...	4	1	3	4	1	....	....	....	....	3	....	....	....	3	2	2
Fostoria	12,215	7	6.90	2	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	4	....	3	3	1	....	....	....	....	2	....	....	....	....	....	....
Fremont	6,236	5	9.62	1	....	2	....	1	....	...	...	...	1	...	...	...	...	...	...	....	....	...	1	....	....	....	....	....	1	....	....	....	1	1	....
Galion	6,939	3	5.19	1	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	1	....	1	1	....	....	....	1	....	....	....	....	....	....	1	....
*Gallipolis	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Greenville	7,815	3	4.61	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	1	....	1	2	....	....	....	....	1	1	....	....	....	....	....	....
Kenton	7,340	5	8.02	....	....	1	....	....		...	...	...	...	...	...	...	...	1	...	1	1	....	1	....	....	....	....	....	....	1	....	....	2	....	....
Lancaster	8,215	11	16.68	2	....	1	....	1	....	...	...	...	...	...	...	...	...	...	...	2	....	2	6	....	2	1	1	1	1	....	....	....	2	....	....
Marietta	11,588	13	13.46	6	....	4	....	3	....	...	...	...	...	...	...	...	...	1	...	....	....	....	7	....	2	....	....	1	1	2	....	....	1	....	....
Marion	15,280	11	8.61	....	....	2	....	1	....	...	...	...	...	...	...	...	...	...	...	1	....	....	6	1	2	....	1	....	1	....	....	....	2	....	....
*Martin's Ferry	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Middletown	11,702	11	11.28	3	....	1	....	....	....	...	1	...	...	...	...	...	...	...	...	1	....	1	8	....	2	3	....	1	....	2	....	....	....	1	....
Mt. Vernon	6,731	2	3.57	....	1	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	2	1	....	....	....	...	....	1	....	....	....	....	1
Norwalk	8,663	4	5.53	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	2	1	1	2	....	....	....	....	....	....	....	....	1	....	....	1
Piqua	12,620	3	2.85	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	1	....	1	1	....	1	....	....	....	....	....	....	....	1	....	....
*Pomeroy	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Salem	7,696	9	14.03	5	1	1	....	....	1	...	...	...	...	...	...	...	...	...	...	2	....	2	4	1	....	2	1	...	....	....	....	....	1	1	2
Troy	5,136	3	7.01	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	3	....	3	....	....	....	....	....	....	....	....	....	....	....	....	1
Urbana	6,723	5	8.91	1	1	2	....	....	1	...	...	...	...	...	...	...	...	...	...	1	....	1	1	....	....	....	1	....	....	....	....	....	1	....	....
Warren	8,320	6	8.65	2	....	1	....	1	....	...	...	...	...	...	...	...	...	...	...	1	1	....	3	1	....	....	....	....	....	1	....	....	....	1	....
Washington C. H	7,992	10	15.02	1	1	2	....	....	....	...	...	...	...	...	...	...	...	2	...	4	1	3	1	....	....	....	....	....	1	....	....	...	1	2	....
Wellston	8,000	6	9.00	3	2	3	1	....	1	...	...	1	...	...	...	...	...	..	...	1	....	1	1	....	....	....	....	1	....	....	....	....	....	1	....
Wellsville	7,464	6	9.61	....	....	2	....	....	....	...	...	...	...	...	...	...	...	...	...	1	....	1	2	....	....	....	....	....	1	....	....	1	....	1	2
Wooster	5,950	11	20.50	....	....	1	....	....	....	...	...	...	...	...	...	...	...	...	...	1	....	1	8	1	1	....	....	1	2	3	....	....		1	....
*Xenia	....	....	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	221,066	187	9.70	32	9	30	1	7	4	...	1	1	2	...	...	...	...	8	...	41	6	29	79	11	11	6	7	8	16	11	....	2	20	15	10

* No report received.

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*Akron	....	....	....				....	....		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....		....	....	....	....	....	....	....	....	....	....
Canton	48,071	28	6.58	5	1	6	1	3	....	....	....	....	....	....	....	....	....	1	....	2	1	1	4	....	....	....	1	....	3	....	....	....	15	1	....
Chillicothe	11,575	20	20.73	7	2	7	1	4	1	....	....	....	....	....	....	....	....	1	....	4	2	2	5	....	..	....	2	....	3	....	....	....	2	2	3
Cincinnati	405,000	478	14.16	145	40	91	3	38	....	1	7	4	....		....	....	....	5	3	83	9	61	224	18	3	15	10	18	32	22	....	20	46	33	45
Cleveland	370,000	513	16.64	184	44	113	1	63	7	3	1	7	....	....	..	1	....	6	1	61	21	12	204	13	5	4	30	18	24	17	....	16	81	60	29
Columbus	135,187	167	14.83	41	18	28	2	21		1	....	2	..	....	....	....	....	1	3	38	10	25	50	3	8	....	3	2	11	11	....	7	15	9	10
Dayton	88,394	94	12.76			27	....	16	....	....	....	3	....	....	....	....	....	1	....	11	2	6	33	2	3	....	1	1	2	4	....	4	12	10	....
*East Liverpool	....	....	....	....	....		....	....	....	....	....	....	....	....	....	....		....	....	....	....	.	....	....	....	....	....	....	....	....	....	....	....	....	....
Findlay	20,000	13	7.80	1	3	3	....	2	....	....	....	....	....	....	1	....	....	....	....	2	....	2	8	2	....	....	....	1	....	....	....	....	....	....	2
*Hamilton	....	....	.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....	....	....	....	....
Ironton	12,952	14	12.97	7	2	5	....	3	....	....	....	....	....	....		....	....	....	2	3	....	3	6	1	....	....	1	....	1	....	....	....	....	...	....
Lima	29,058	22	9.08	4	....	8	....	7	....	....	....	....	....	....	....	....	....	....	....	8	1	5	3	....	1	....	....	....	2	.. ..	....	....	2	....	3
Mansfield	17,296	13	9.02	4	.	4	....	1	1	....	....	....	....	....	....	....	....	1	....	1	....	1	8	....	....	....	....	1	2	....	....	2	....	1	....
*Massillon	.... .		....	....		....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	...	....	...	....	..	....	....	....	....	....	....	..	....
Newark	19,594	23	14.09	9	1	7	....	5	....	....	....	2	....	....	....	....	....	....		4	1	2	9	4	3	....	....	....	....	2	....	...	1	2	....
Portsmouth	13,325	17	15.31	....	.	4	....	...		....	....	....	....	....	....	....	....	....	1	1	....	....	12	....	1	....	....	....	2	....	....	3	....	....	3
Sandusky	20,888	15	8.14	4	1	7	...	2	2	....	....	....	....	....	....	..	....	2	....	....	....	....	....	....	....	....	....	....		....	....	..	8		1
Springfield	45,020	44	11.73	8	7	13	1	6	1	....		....	....	....	....	....	....	2	....	4	2	2	20	1	....	...	1	1	8	4	....	1	3	4	4
*Steubenville	....	....		....	....	....	.	....		....	....	....	....	....	....	....	....	....	....	...	....		....	....	....	....	....	....	..	..	....	....	....	....	....
Tiffin	13,900	7	6.04		..	1	....	....		....	....	....	....	....	....	....	....	1	....	4	....	2	2	....	....	....	....	.. ..	1	1	....	...	....	....	....
Toledo	120,036	129	12.81	43	10	24	....	9	2	2	....	3	1	....	....	1	....	1	1	10	2	7	54	4	1	1	6	4	5	4	....	1	24	17	22
Youngstown	61,333	47	9.03	20	2	10	....	9	....	....	....		....	....	....	....	....	1	....	7	....	....	20	2	1	....	1	1	3	3	....	2	6	3	8
*Zanesville	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	...	...		....	....	....		....	....	....	....	....	....	...	....	....	....	....
Totals	1,431,629	1,644	13.08	482	131	368	9	189	14	7	8	21	1	2	1	2	...	23	11	243	51	132	662	50	26	20	56	47	99	68	....	56	215	142	130

* No report received.

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Alliance	11,306	7	7.43	3	...	4	...	3	...	...	...	1	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	1	...	...
Bellaire	11,783	18	18.33	6	2	4	...	...	...	...	1	1	...	...	...	...	...	...	2	6	1	3	7	1	...	...	2	2	...	1	...	...	1	...	2
Bucyrus	8,516	6	8.45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	1	3	1	...	...	...	...	...	...	...	1	...
Circleville	7,[illegible]06	12	19.54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	8	...	...	...	...	...	1	2	...	...	...	3	2
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	7	8.87	...	...	2	...	...	1	...	...	...	...	...	...	...	...	1	...	2	...	2	2	...	...	...	...	...	1	...	...	1	...	1	...
Fostoria	12,215	10	9.82	5	2	4	...	2	2	...	...	...	...	...	...	...	...	...	...	2	...	...	3	...	...	1	...	...	...	...	...	...	...	1	1
Fremont	6,236	5	9.62	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	1	1	...	...	...	...	...	...	...	...	...	2	...
Galion	6,939	5	8.65	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	3	1	...	...	1	...	1	...	...	...	...	...	...
*Gallipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
*Greenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kenton	7,340	6	9.81	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	1	1	...	...	...	...	...	...	...	...	...	1	1	...
Lancaster	8,215	8	11.68	2	...	2	...	1	...	...	...	1	...	...	...	...	...	...	...	1	1	...	4	1	...	...	...	...	3	...	...	...	1	...	...
Marietta	11.588	18	18.64	7	1	3	...	2	...	...	...	...	...	...	...	...	...	...	1	4	...	4	9	...	...	...	...	1	1	3	...	...	2	...	...
Marion	15,280	12	9.04	...	...	6	...	4	...	...	...	...	1	...	...	...	...	1	...	1	1	...	5	1	...	...	...	...	...	...	...	1	...	...	...
*Martin's Ferry	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Middletown	11,702	3	3.08	1	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	1	1	1	...	...	...	...	...	...	...	...	...	...	...
Mt. Vernon	6,731	6	11.44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	4	1	...	1	...	...	2	...	...	...	...	...	...
Norwalk	8,663	2	2.78	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Piqua	12,620	12	11.40	2	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	5	1	4	2	...	...	...	...	...	...	...	...	...	3	1	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	11	17.15	2	2	3	1	...	...	...	...	...	...	...	...	...	1	...	...	2	1	1	6	2	1	1	...	...	2	...	...	...	...	...	...
Troy	5,136	12	28.04	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	5	2	3	2	1	...	...	...	1	...	...	...	...	...	...	1
Urbana	6,723	6	10.71	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	3	...	...	...	...	...	...	...	...	...	1	1	...
Warren	8.320	12	17 30	3	...	3	...	1	...	...	...	...	...	...	...	...	...	...	1	2	...	1	4	1	...	...	...	...	1	...	...	...	2	1	1
Washington C. H.	7,992	5	7.50	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	3	...	3	1	...	...	...	...	...	...	1	...	...	...	...	...
Wellston	8,000	13	19 50	4	4	7	1	1	1	...	...	2	...	...	...	...	...	...	...	1	...	1	3	1	...	...	...	...	1	...	...	...	...	2	2
Wellsville	7,461	6	9.64	2	1	1	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	1	1	...	...	...	...	...	...	1	...	...	2	1	2
Wooster	5,950	7	14.12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	4	2	...	...	1	...	1	...	...	...	...	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	218,151	209	11.79	38	14	46	2	17	4	...	3	5	1	...	...	...	1	3	4	48	7	31	82	15	4	4	4	4	14	8	...	2	14	15	11

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF AUGUST, 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated.)	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canton	48,071	18	4 50	7	...	4	...	1	...	...	...	...	...	...	...	...	...	2	1	5	2	3	3	...	1	...	...	...	1	1	...	...	6	...	...
Chillicothe	11,575	23	13 85	3	3	10	...	3	3	...	...	1	...	...	...	...	...	2	...	4	2	2	8	2	1	...	1	1	1	1	...	...	1	...	1
Cincinnati	405 000	359	10 64	67	33	46	3	7	...	3	5	4	...	...	2	...	...	6	4	77	16	39	187	11	4	11	7	11	25	12	...	15	20	30	46
Cleveland	370,000	440	11 57	159	58	96	5	45	1	4	4	1	...	...	...	3	...	6	3	52	11	16	182	8	2	5	29	16	13	22	...	27	84	22	41
Columbus	135,187	137	12.16	26	8	32	2	7	...	1	...	3	1	...	...	...	1	7	...	37	11	23	47	4	7	1	3	2	10	8	...	3	11	6	10
Dayton	88,394	115	15.61	...	...	37	...	12	6	1	1	5	...	...	...	...	...	3	1	17	4	9	42	1	2	1	2	1	9	1	...	6	9	7	...
*East Liverpool	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Findlay	20,000	11	6 60	3	2	3	...	2	...	...	...	...	...	...	...	1	...	...	...	2	...	2	5	1	...	...	...	...	...	1	...	...	1	...	1
*Hamilton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ironton	12,952	15	13.90	...	...	2	1	...	...	...	1	...	...	...	...	...	...	...	...	3	...	1	10	1	1	...	1	1	3	...	...	1	...	...	...
Lima	29 058	29	11.98	5	5	9	...	8	...	...	...	1	...	...	...	...	...	...	...	5	1	4	6	...	...	...	...	2	3	1	...	...	9	...	3
Mansfield	17 296	14	9.15	3	3	6	...	1	1	...	...	...	...	...	...	1	...	...	2	1	...	...	6	...	1	...	2	1	1	...	...	...	1	...	...
*Massillon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Newark	19,594	19	11.64	3	2	3	...	...	...	...	...	1	1	...	...	...	...	1	...	3	1	2	10	1	2	...	1	4	...	...	...	...	...	3	3
Portsmouth	13,325	12	10.77	1	5	3	1	...	...	...	...	1	...	...	...	...	...	1	...	2	...	2	1	...	...	...	...	...	...	...	...	1	5	1	4
Sandusky	20,898	20	11.49	4	...	4	...	4	...	...	...	...	...	...	...	...	...	...	...	3	2	1	2	...	...	...	...	...	2	...	...	...	8	3	...
Springfield	45,020	48	12.79	10	2	9	...	5	...	...	...	3	1	...	...	...	...	...	...	5	2	2	30	5	2	...	...	6	7	2	...	2	2	2	...
*Steubenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13,900	7	6.04	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	5	...	...	...	1	1	...	2	...	...	...	1	...
Toledo	120,036	166	24.93	56	14	47	1	22	2	...	3	2	1	...	...	1	...	2	4	22	7	13	65	2	...	3	8	2	3	...	...	4	23	9	17
Youngstown	61,338	63	12.33	21	8	22	...	8	...	1	1	1	...	...	...	...	...	1	3	5	1	4	22	1	...	...	4	...	4	...	...	...	9	5	...
*Zanesville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	1,431,629	1,496	12 54	368	143	334	13	125	13	10	15	23	4	...	2	6	1	32	18	243	60	123	631	37	23	21	59	48	82	51	...	59	189	89	126

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF AUGUST, 1898.

Cities of less than 10,000 inhabitants (census 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexy.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases	Total violence.	Premature and still-births.
Alliance	11,306	9	9.55	1	1	3	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	4	...	1	...	...	...	...	1	...	...	1	...	...
Bellaire	11,783	9	9.17	2	3	3	...	1	...	...	2	...	...	...	...	...	...	...	...	2	...	...	3	...	...	...	...	...	1	1	...	1	...	1	...
Bucyrus	8,516	8	11.27	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	3	...	3	3	1	...	...	...	...	1	...	...	...	...	1	2
Circleville	7,366	10	16.29	2	2	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	7	...	...	1	...	1	...	1	...	...	...	1	...
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	8	10.14	...	...	2	...	...	...	...	...	1	...	...	...	...	...	1	...	4	1	3	2	2	...	...	...	...	...	...	...	...	...	...	...
Fostoria	12,215	11	10.80	3	1	4	...	3	...	...	1	...	...	...	...	...	...	...	...	3	...	3	4	1	...	...	...	...	...	...	...	...	...	...	...
Fremont	6,236	7	13.47	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	5	1	2	...	...	...	1	...	...	1	...	...	...
Galion	6,939	5	8.65	...	1	2	...	...	...	...	...	1	...	...	...	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	1	1	...
*Gallipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
*Greenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kenton	7,340	8	13.08	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	2	2	...	...	...	...	...	1	...	...	...	1	1	...
Lancaster	8,215	9	13.15	1	...	2	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	4	1	...	...	...	1	2	...	...	...	2	1	...
Marietta	11,588	8	8.29	3	1	2	...	...	...	...	1	...	1	...	...	...	...	...	...	2	...	2	4	...	...	...	...	2	...	1	...	...	...	...	1
Marion	15,280	12	9.04	...	...	6	...	3	1	...	...	...	1	...	...	...	...	...	...	2	1	...	3	1	...	...	...	...	...	...	...	...	...	1	1
*Martin's Ferry	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Middletown	11,702	14	14.36	6	1	5	...	...	...	...	5	...	...	...	...	...	...	...	...	1	...	...	7	1	...	2	...	3	...	...	...	1	...	1	...
Mt. Vernon	6,731	9	16.09	3	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	4	...	4	2	...	...	...	...	2	...	...	...	...	1	...	1
Norwalk	8,663	3	4.16	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	1	...	1	...	...	...	...	...	...	...
Piqua	12,620	10	9.51	3	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	2	6	...	1	...	...	2	1	...	...	1	1	...	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	6	9.35	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	4	1	...	...	...	...	2	...	...	...	1	...	1
Troy	5,136	1	2.31	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Urbana	6,723	13	23.20	3	1	5	...	1	...	...	...	...	...	...	...	...	...	2	...	1	...	1	6	...	...	...	...	...	3	2	...	1	1	...	...
Warren	8,320	10	14.42	1	...	2	...	...	...	...	2	...	...	...	...	...	...	...	...	3	1	2	4	2	...	...	...	...	...	...	...	...	1	...	1
Washington C. H.	7,992	9	13.52	2	...	2	...	...	...	1	...	...	...	...	...	...	...	1	...	4	1	2	3	...	...	...	...	...	...	1	...	...	...	...	...
Wellston	8,000	7	10.50	3	2	1	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...
Wellsville	7,464	2	3.22	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Wooster	5,950	8	16.14	...	...	2	...	...	...	...	...	...	1	...	...	...	...	1	...	1	...	1	4	1	...	...	...	...	2	...	...	...	...	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	213,151	196	11.04	31	14	52	...	16	2	1	12	2	3	...	...	...	...	7	3	42	5	31	81	12	4	4	...	12	14	7	...	5	10	8	9

*No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF SEPTEMBER, 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	...	...	...	...		...			...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canton	48,071	24	5.99	3	2	7	3	2	...	...	...	...	...	...	...	...	...	1	...	1	1	...	6	1	1	...	...	...	3			1	10	...	...
Chillicothe	11,575	25	25.92	3	2	5	.		...	...	2	...	...	...	...	...	...	3	...	5	1	4	6		2	...	...	...	3	1	...	...	7	2	
Cincinnati	405,000	350	11 26	73	28	26	5	6	...	1	2	2	...	2	...	...	...	7	1	74	20	41	276	17	11	9	12	7	38	11	...	19	35	30	40
Cleveland	370 000	393	12.75	125	42	82	9	29	...	1	2	...	...	.	...	2	...	4	1	43	16	7	60	5	4	4	24	15	21	16	2	12	67	24	29
Columbus	135.187	104	9 23	16	10	23	1	4	...	...	...	1	...	...	...	...	...	9	...	22	3	18	42	4	5	...	2	3	4	...	...	5	12	4	15
Dayton	88,394	61	8.28	...	...	12	...	...	...	...	...	7	...	...	...	...	.	4	1	13	3	6	22	2	1	...	1	2	2	2	...	1	8	6	...
*East Liverpool	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...
Findlay	20,000	12	7.20	2	1	2	...	...	1	...	...	...	...	...	...	...	...	1	...	3	1	2	6	2	...	...	...	...	1	1	...	...	1	...	1
*Hamilton	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...
Ironton	12,952	13	12.04	...	1	3	...	1	1	...	...	...	...	...	...	...	...	1	...	6	...	3	7	...	...	1	...	1	1	...	...	...	...	...	3
Lima	29,058	25	10 32	6	2	9	1	3	...	...	1	3	...	...	...	...	...	...	...	...	...	...	4	...	...		...	...	2	1	1	...	6	6	1
Mansfield	17,296	17	11 22	2	...	4	...	...	...	...	...	1	...	...	...	...	...	3	...	2	...	2	6	...	...	1	1	...	1	...	...	2	2	3	...
*Massillon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...		...	...	...	...	...	...	...	...	...	...
Newark	19,594	19	11 64	3	...	4	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	1	11	2	1	1	...	2	2	...	...	...	...	2	2
Portsmouth	13,325	19	17.11	...		8	2	2	...	1	...	1	.	...	1	...	...	1	...	3	...	3	7	...	...	...	1	3	1	1	1	...	...	1	2
Sandusky	20,888	20	11.49	4	3	8	1	3	...	...	...	...	1	...	1	...	...	1	...	1	1	...	5	1	1	1	...	...	2	.	...	...	6	...	1
Springfield	45,020	34	9.07	5	2	8	1	3	...	...	...	...	1	...	...	1	...	2	...	11	3	6	12	...	1	...	1	1	3	...		...	2	1	2
*Steubenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13,900	8	6 90	...		3	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	5	1	...	...	...	1	...	...	...	1	...	...	1
Toledo	120,036	160	15.99	35	17	45	4	15	2	...	1	3	8	...	...	1	...	4	1	29	5	17	57	1	2	4	1	1	10	1	...	3	20	16	15
Youngstown	61,333	34	6 49	12	5	10	...	4	...	...	...	...	...	...	...	...	...	2	3	3	1	2	12	...	...	...	3	...	3	...	1	2	4	5	...
*Zanesville	...	...	...	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	.	...	...	...	...	...	...	...	...
Totals	1,431,629	1,348	11 30	289	115	269	27	73	4	3	8	14	10	2	2	4	...	55	7	218	55	112	584	36	29	21	46	36	97	34	5	46	180	100	112

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF SEPTEMBER 1898.

Cities of less than 10,000 inhabitants (census of 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	9	9.55	1		2		1										2		4	3	1	2						1	1				1	
Bellaire	11,783	6	6.11	2	1	2	1	1												3		2											1		
Bucyrus	8 516	2	2.80			2							1					1																	1
Circleville	7,366	11	17.92	2		3		1										2		1			7						1			1			
*Defiance	...	...	...																																
Delaware	9,170	7	8 87	2		1												1		1		1	3		1		2						1		2
Fostoria	12,215	14	18.80	3	1	4			1									3		4		1	5	1								1		1	
Fremont	6,236	5	9.62	1	1	1		1												2		2	2		1							1			
Galion	6,939	9	15.57	2		2		2												1		1	3	2										3	
*Gallipolis	...	...	...																																
*Greenville	...	...	...																																
Kenton	7,340	6	9.81																	3	1	1	2						1				1		1
Lancaster	8,215	5	7.30		1	1					1									1		1	2		1			1					1		
Marietta	11,588	6	6.21	2																2		2	4						2	1					3
Marion	15,280	10	7.85			4							1					1		4			1		1									1	
*Martin's Ferry	...	...	...																																
Middletown	11,702	8	8.20	1		1		1												3		3	4	1		1			1						
Mt. Vernon	6,731	8	5.72	1																			2										1		
Norwalk	8 663	8	11.12			1					1									2			5	1	1			1		1		1			
Piqua	12,620	6	5.70		1	1												1		1		1	3					1	1	1			1		
*Pomeroy	...	...	...																																
Salem	7,696	8	12.48	1																2	2		5	1					2				1		
*Troy	...	...	...																																
Urbana	6,723	10	17.82	1	1	1			1											1			5		1				1				3		
Warren	8,320	5	7.21			2							1							1		1	2	1					1						
Washington C. H.	7,992	7	10.51	3		4		1			2							1		2	1	1											1		
Wellston	8.000	11	16.50	2	1	8	1	3		1								2					3			1			1			1			
Wellsville	7.464	4	6.44			2	1											1					1											1	1
Wooster	5,950	8	16 14			3		2				1											4	1			1		1					1	
*Xenia	...	...	...																																
Totals	208,015	168	9.69	24	7	45	3	12	2	1	4	1	3	...	...	...	...	15	...	38	7	18	65	8	6	2	3	3	13	4	...	5	11	8	8

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF OCTOBER, 1898.

Cities of 10,000 inhabitants (census of 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus	Diarrhœal diseases	Dysentery	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...
Canton	48,071	32	7.99	5	4	8	6	...	...	...	1	...	...	...	...	...	...	1	...	2	1	1	6	...	...	...	2	2	2	...	...	...	15	1	...
Chillicothe	11,575	18	18 65	4	...	7	1	...	1	...	...	1	...	...	...	...	...	3	1	5	1	3	6	1	...		1		3	...	...	1	...	...	...
Cincinnati	405,000	448	13.27	111	45	73	10	6	3	1	7	3	...	...	...	...	...	14	...	85	14	39	222	22	6	17	9	10	21	14	1	25	35	33	46
Cleveland	370,000	335	10.87	71	46	81	29	8	2	...	2	2	...	1	...	2	...	21	...	50	11	18	132	11	3	3	22	10	18	12	...	17	46	19	28
Columbus	135,187	114	10 05	13	4	14	2	1	...	...	...	1	...	...	...	...	...	6	...	30	2	26	51	4	13	2	...	1	10	4	...	4	9	9	5
Dayton	88,394	87	10 67	...	...	9	3	1	...	...	...	...	...	...	...	...	...	2	...	8	2	2	41	3	...	1	1	2	8	3	...	3	15	4	...
*East Liverpool	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Findlay	20,000	17	10 20	2	2	3	...	3	...	...	...	...	...	...	...	...	...	...	...	1	...	1	11	...	1	1	...	...	5	...	...	...	1	1	1
*Hamilton	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	...	...	...	...
Ironton	12,952	7	6 50	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...	2	3	1	...	...	...	1	...	...	...	...	1	...	...
Lima	29,058	20	8.26	4	2	6	...	2	...	...	1	...	...	...	.	...	...	3	...	2	...	2	3	...	...	...	...	1	1	1	...	...	9	...	...
Mansfield	17,296	15	10.47	1	1	3	...	...	...	...	...	...	1	...	...	...	...	2	...	..	...	...	5	1	1	...	2	...	1	...	...	...	2	5	...
*Massillon	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...
Newark	19,594	14	8.57	1	2	4	1	1	...	...	1	...	...	...	...	...	...	...	...	4	1	2	4	1	...	...	..	...	2	1	...	...	...	2	1
Portsmouth	13 325	15	13.51	...	...	2	1	...	...		...	...	...	...	..	...	...	1	...	1	...	1	7	1	...	1	...	1	...	1	...	...	3	2	2
Sandusky	20.888	14	8.04	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	2	1	1	5	...	...	1	1	...	3	...	...	...	4	3	4
Springfield	45,020	23	6.13	1	2	3	2	...	...	...	...	1	..	...	..	...	...	...	...	5	1	4	12	2	4	...	...	...	3	1	...	1	2	1	2
*Steubenville	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	..		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13 900	14	12 09	...	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	4	2	2	4	...	2	2	...	...	...	...	...	...	3	1	...
Toledo	120 036	133	13.29	24	15	25	5	5	1	...	2	2	1	...	...	...	...	6	...	21	4	10	56		...	...	5	4	7	1	...	3	21	10	11
Youngstown	61,333	33	6.46	3	...	3	...	...	...		...	...	...	...	...	...	...	1	...	3	1	2	16	1	...	2	1	...	3	...	...	3	2	7	12
*Zanesville	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...
Totals	1,431,629	1,339	11.22	240	123	244	60	27	7	1	14	10	2	1	...	2	...	63	1	225	41	116	584	48	30	30	44	32	87	38	1	57	168	98	112

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF OCTOBER, 1898.

Cities of less than 10,000 Inhabitants (census of 1890).	Population (estimated).	Total deaths, all causes.	Annual rate per 1 000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	16	16.98	1		2							1					1		2		2	7						2			3	4	1	
Bellaire	11,783	10	10.18		3	1	1													4	1	2	4		2							2		1	
Bucyrus	8,516	5	7.05			1												1		1		1	3	2		1									
Circleville	7,366	11	17.92	1	2	3		1										2					7				1		1					1	
*Defiance																																			
Delaware	9,470	7	8.87																				5	1					3	1			2		
Fostoria	12,215	3	2.95			1	1													1		1												1	
Fremont	6,236	3	5.77																	1		1	2		1				1						1
Gallion	6,939	7	12.11		2																		5	1	1				1	1		1		2	
*Gallipolis																																			
*Greenville																																			
Kenton	7 340	9	14.7			3	2	1												3		3	1										1	1	1
Lancaster	8,215	9	13.15	1		1												1		2		2													
Marietta	11,588	7	7 25		1	3												3		1		1	2									1	1		
Marion	15,280	9	7.68			6							1					3		1			2	1					1						
*Martin's Ferry																																			
Middletown	11 702	9	9.23	1																2	1	1	7	1				1	2			2			
Mt. Vernon	6,731	3	5.72			1												1					2			1									
Norwalk	8,663	3	4.16																	2		1	1						1						
Piqua	12,620	16	15 20	1	2	4	3											1		7	1	5	4	1					3						
*Pomeroy																																			
Salem	7,696	3	4 68	1																2		1	1	1											
*Troy																																			
Urbana	6,723	8	14 26			1														1		1	6	1					3			1			
Warren	8,320	7	10.09																	1		1	6	2				1	1	1		1			2
Washington C. H	7,992	4	6.01																	1		1	2										1		1
Wellston	8,000	7	10.50		1	2						1			1					1			3	1			1					1		1	1
Wellsville	7 464	3	4.82	1																			2	1									1		
Wooster	5,950	6	12 12																	2		2	3	1					2					1	
*Xenia																																			
Totals	208,015	165	9 52	7	11	29	7	2				1	3					13		35	3	26	75	14	4	2	2	2	21	3		12	10	9	6

* No report received

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF NOVEMBER 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
*Akron																																			
Canton	48,071	28	6.58	3	5	9	7												1	3	2	1	5						3			2	9		2
Chillicothe	11,575	14	14.52	4	4	6	1	1				1						1		5		2	3	1						1		1			2
Cincinnati	405,000	443	13.21	51	25	34	8		1		2	2				1		12	1	87	15	51	253	15	11	31	9	10	45	9	2	30	38	26	37
Cleveland	370,000	375	12.16	62	56	72	36	2			2	1				8		9	1	57	16	11	172	13	3	11	18	5	23	14		48	45	21	35
Columbus	135,187	114	10.05	10	2	11	3					2						4	1	32	6	21	40	5	5	2		2	7	2		9	18	11	9
Dayton	88,394	110	14.93			18	4		1			1				1		4		18	5	6	49	2			2	1	12	1		9	16	8	
*East Liverpool																																			
Findlay	20,000	12	7.20	2		1	1													5		4	5	2			1	1				1	1		
*Hamilton																																			
Ironton	12,952	16	13.93	5		2						1								6	1	2	7		1	1		2				1		1	
Lima	29,058	22	8.69	4	2	2	1				1									2	1	1	11	2			1	1	5	1			7		3
Mansfield	17,296	17	11.79			2			1									1		3	1	2	9		2				4			1	2	1	
*Massillon																																			
Newark	19 594	14	8.57	1		2						1								1		1	7	2					1	1		2	1	3	2
Portsmouth	13,325	18	16.21			2	1				1									6		4	4		1				2				3	3	
Sandusky	20,888	18	10.34		2	2	2													2		2	5		1			1	2			1	8	1	2
Springfield	45,000	35	9.07	3	3	12	6										1	2		6	2	3	12		2	2	3	1	3	1			4	1	2
*Steubenville																																			
Tiffin	13,900	17	14.68			1												1		7	1	6	8	1			1	1	2				1		
Toledo	120,036	127	12.77	31	8	27	13	3	1				2		1		1	5		16	4	10	56		4	4	13	5	3	2		9	22	6	15
Youngstown	61,333	46	9.35	4	9	6	2								1			1		3	1	2	25	2		1			8	2		5	6	6	6
*Zanesville																																			
Totals	1,431,629	1,426	11.95	180	116	214	85	6	4	...	6	9	2	...	2	10	2	40	4	259	55	129	671	45	30	52	48	30	120	34	2	119	181	88	115

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF NOVEMBER, 1898.

Cities of less than 10,000 inhabitants (census of 1890).	Population (estimated).	Total deaths all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhoeal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's diseases.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	4	4.25	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	1	1	1	...
Bellaire	11,783	15	15.27	3	1	4	...	...	...	...	3	...	...	...	...	...	...	...	...	2	1	1	8	...	...	...	...	1	2	1	...	1	...	1	2
Bucyrus	8,516	5	7.05	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	4	...	1	...	...	...	1	...	...	...	...	1	2
Circleville	7,366	13	21 18	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	4	1	1	7	...	...	...	...	...	...	2	...	...	1	...	...
*Defiance	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delaware	9,470	7	8 87	...	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	3	...	...	...	...	1	1	1	...	...	...	1	...
Fostoria	12,2 5	6	5 80	3	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	1	1	...	...	...	...	...	...	...	...	...	...	1	...
Fremont	6 2 6	6	1 .54	1	...	2	...	...	2	...	...	...	...	...	...	...	...	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	2	...	1
Galion	6 939	6	10.38	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	2	...	...	...	...	...	1	...	...	1	1	1	...
*Gallipolis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenville	7,815	5	7.66	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	2	1	2	...	...	...	...	...	...	1	...	...	...	...	...
Kenton	7,340	9	14.71	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	3	2	4	1	1	...	...	...	1	...	...	1	...	...	...
Lancaster	8,215	9	13.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	3	...	...	...	...	...	2	...	...	1	1	1	1
Marietta	11,588	13	13 46	2	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	4	1	2	5	...	...	...	...	...	1	...	...	3	2	1	...
Marion	15,280	15	11.78	...	...	3	...	...	1	...	...	...	...	...	...	...	...	...	...	3	...	...	7	...	...	...	...	...	3	...	...	...	...	1	1
*Martin's Ferry	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Middletown	11,702	6	6 '6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	1	1	1	...	...	1	...	...	2	...	...	...
Mt. Vernon	6 741	9	17.16	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	6	1	...	...	...	1	2	1	...	1	1	...	...
Norwalk	8,663	6	8,32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	2	3	...	2	...	...	...	...	...	...	...	...	...	...
Piqua	12,620	2	1 90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...	1	...	...	...	...	...	...	...
*Pomeroy	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	8	12.48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	1	2	4	...	2	...	...	...	1	...	...	...	...	...	...
Troy	5,136	9	21.03	1	...	3	1	...	...	...	...	...	...	...	...	...	...	2	...	1	1	...	1	...	...	...	...	...	1	...	...	...	3	...	...
Urbana	6,723	11	19 63	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	...	4	...	...	...	...	...	2	...	...	...	1	2	...
Warren	8,320	5	7.21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	1	...	...	...	...	...	...
Washington C. H.	7,992	5	7.51	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	1	...	...	...	...	1	...	...	...	...	2	...	...
Wellston	8,000	8	12.00	...	...	3	1	1	1	...	...	...	...	...	...	...	...	...	...	1	...	1	4	...	...	...	...	...	3	...	1	...	...	...	2
Wellsville	7,464	5	8.04	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	1	...	...	...	...	1	...	2	...
*Wooster	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
*Xenia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	215,116	187	10.43	12	4	23	4	3	4	...	3	...	...	...	...	...	...	3	...	49	12	24	87	3	8	1	1	5	23	6	1	12	15	13	9

No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF DECEMBER, 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Permature and still-births.
*Akron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canton	48 071	23	5 66	...	4	7	5	...	...	...	...	...	...	...	...	...	...	2	...	2	1	1	4	...	1	...	...	...	3	...	...	...	10	...	...
Chillicothe	11,575	30	31.10	1	6	4	3	...	...	...	...	...	...	...	...	...	...	...	...	7	1	4	16	3	1	...	...	1	3	...	...	6	...	3	...
Cincinnati	405,000	511	15. 4	56	30	58	4	1	2	1	2	3	...	...	2	...	...	21	1	109	19	67	275	21	11	32	8	12	37	6	3	54	37	32	41
Cleveland	370,0 0	491	15.90	94	47	87	31	1	3	...	...	...	...	...	...	6	...	22	...	73	18	22	239	12	8	17	32	15	23	14	2	56	62	21	40
Columbus	135,187	162	14.38	24	8	11	2	...	...	...	...	...	...	...	...	...	...	3	...	45	9	30	80	12	9	2	6	2	9	6	...	13	15	9	9
Dayton	88,394	115	15 61	...	...	9	3	...	1	...	...	...	...	...	...	...	...	1	...	27	5	18	60	5	4	...	...	3	12	...	...	16	11	8	...
*East Liverpool	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Findlay	20,000	10	6.00	1	...	2	...	...	...	...	...	...	...	...	...	1	...	...	...	2	...	2	5	1	...	...	...	...	1	...	...	1	...	1	...
*Hamilton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ironton	12,952	15	13.90	1	3	1	...	...	...	...	...	...	...	...	...	...	...	1	...	5	...	2	8	...	...	...	...	1	3	...	...	2	...	1	...
Lima	29,058	29	11 98	4	3	4	...	...	2	...	...	...	...	...	...	...	...	...	...	7	2	3	11	...	2	...	...	...	4	...	...	2	6	1	4
Mansfield	17,296	5	3.47	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	4	1	...	...	...	...	2	...	...	...	...	...	...
*Massillon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Newark	19,594	12	7 36	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	6	2	2	...	...	...	2	...	...	...	1	1	2
Portsmouth	13,325	24	21.51	3	3	3	...	...	...	...	1	...	...	...	...	...	...	2	...	6	...	6	9	...	2	1	...	...	1	...	...	5	6	...	3
Sandusky	20,888	21	12.07	2	1	2	2	...	...	...	...	...	...	...	...	...	...	...	...	5	1	3	6	...	...	...	1	1	3	...	...	1	8	...	1
Springfield	45 020	34	9.07	3	3	5	1	...	1	...	...	...	...	...	...	1	...	2	...	5	2	1	22	5	3	...	3	...	7	...	...	1	...	2	2
*Steubenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13,900	9	7.77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	4	...	1	2	...	...	1	...	...	...	3	...	...
Toledo	120,0 6	122	12.11	14	13	23	7	...	1	...	2	...	1	...	1	1	..	4	1	20	3	15	62	2	1	6	5	4	8	2	...	8	8	9	10
Youngstown	61,333	48	9.39	5	3	10	2	...	...	...	...	...	...	...	...	...	...	6	1	7	1	4	24	1	...	2	2	1	6	1	...	3	...	7	3
*Zanesville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	1,431,6 9	1,661	13.92	208	124	227	60	2	10	1	5	3	1	...	3	9	..	64	3	326	63	182	835	65	45	62	57	40	125	29	5	168	167	95	115

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE MONTH OF DECEMBER, 1898.

Cities of less than 10,000 inhabitants (census of 1890)	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhoeal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever	Scarlet fever.	Tonsilitis.	Typhoid fever	Whooping cough.	Total constitutional diseases	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	11,306	8	8.49	....	....	2	....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	1	4	....	....	....	....	....	1	....	....	....	....	....	1
Bellaire	11,783	14	14.26	6	3	6	....	....	....	....	3	....	....	....	1	....	....	1	....	2	....	2	6	....	....	....	1	1	1	1	....	1	....	....	1
Bucyrus	8.516	5	7.05	....	....	2	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	3	....	1	....	1	....	1	....	....	....	....	....	....
Circleville	7,366	10	16.29	1	....	2	....	....	....	....	....	1	....	....	....	....	....	1	....	2	2	....	6	....	....	....	....	....	....	1	....	1	....	....	....
*Defiance	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Delaware	9,470	7	8 87	....	1	2	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	5	1	....	....	....	....	4	....	....	....	....	....	....
Fostoria	12,215	10	9 82	2	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	2	4	....	....	....	....	....	....	....	....	1	....	....	....
Fremont	6 236	9	17.30	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2	....	3	1	2	2	1	1	....	....	....	....	....	....	....	2	....	....
Galion	6,939	3	5.19	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	1	....	....	....	....	2	....	....	....	....	....	1
*Gallipolis	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Greenville	7,815	6	9 21	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	1	3	1	....	....	1	....	1	....	....	....	....	1	....
Kenton	7,340	6	9.81	1	....	2	1	....	....	....	1	....	....	....	....	....	....	....	....	2	1	1	1	....	....	....	....	....	1	....	....	....	1	....	....
Lancaster	8,215	13	18 90	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	2	7	3	....	....	....	1	2	1	....	....	3	....	....
Marietta	11,588	8	8 29	3	2	4	3	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	1	....	1	....	....	1	....	....	1
Marion	15,280	8	6.26	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	2	....
*Martin's Ferry	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
*Middletown	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Vernon	6,731	7	12.50	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	2	1	3	....	....	....	....	....	1	1	....	1	....	1	....
Norwalk	8,663	4	5 56	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	3	....	1	....	....	....	1	....	....	1	....	....	....
Piqua	12 620	16	18.70	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	2	12	....	2	....	3	....	2	....	....	3	1	1	....
*Pomeroy	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Salem	7,696	2	3 13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....
Troy	5 136	6	14.02	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	4	1	2	1	....	1	....	....	....	....	....	....	....	....	....	....
Urbana	6.723	11	19.63	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	2	5	....	....	....	....	....	3	....	....	1	2	....	1
Warren	8,320	9	12 95	1	....	1	....	....	....	....	....	....	1	....	....	....	....	....	....	1	1	....	5	2	....	1	....	....	1	....	....	....	1	1	3
Washington C. H.	7,992	18	27.27	4	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	....	....	1	2	....	2	3	5	....
Wellston	8,000	12	18.00	6	2	2	1	....	1	....	....	....	....	....	....	....	....	....	....	3	....	1	7	....	1	2	1	....	1	1	....	1	....	....	....
Wellsville	7,464	5	8.04	1	....	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....	....	2	....	....	....	1	....	....
Wooster	5,950	13	26.22	....	....	3	....	....	....	....	....	....	....	....	....	....	....	2	....	2	....	2	8	....	....	1	....	....	2	....	....	....	....	....	....
*Xenia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	209,361	210	12.04	29	10	37	5	1	1	...	6	1	1	...	1	...	...	10	...	39	8	22	106	9	7	4	8	2	28	7	......	13	14	11	8

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE YEAR 1898.

Cities of 10,000 inhabitants (census 1890) or over.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro spinal meningitis.	Cholera morbus.	Diarrhoeal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Akron	41 630	470	11.29	97	40	86	13	20	3	2	4	4	5	1	2	3	...	4	2	63	19	31	210	32	17	3	18	24	40	11	8	34	51	12	48
Canton	48,071	302	6 28	53	29	50	22	6	...	...	...	...	...	...	...	...	...	14	3	32	13	17	80	5	9	1	8	4	27	7	.	19	132	6	2
Chillicothe	11,575	161	14 17	45	23	40	5	7	6	...	3	3	...	...	...	...	.	12	...	59	7	29	58	9	5	...	6	3	14	1	...	10	...	7	13
Cincinnati	405,000	5,446	13.45	974	520	632	78	73	17	[illegible]	30	30	7	12	8	8	2	105	68	1,094	195	642	3,012	185	85	289	180	139	371	191	12	519	397	326	513
Cleveland	370,000	4,977	13.45	1,267	562	767	146	162	29	11	15	16	14	12	...	29	...	121	16	716	108	439	2,426	102	60	130	338	156	281	222	13	499	717	270	470
Columbus	135 187	1,390	10 28	233	109	185	15	34	16	...	8	6	9	16	...	1	3	33	10	321	78	219	704	54	79	19	31	39	71	52	5	111	98	82	103
Dayton	88,394	1,120	12 67	202	92	174	13	29	16	1	22	11	2	8	2	2	...	18	6	234	43	120	575	22	40	12	18	21	113	34	1	106	68	69	108
*East Liverpool	...	...	...	..	...	...	...	..	...	...	...	..	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Findlay	20,000	172	8.60	22	17	23	3	8	1	...	...	...	...	...	1	6	...	2	...	41	6	30	93	10	4	3	5	4	23	4	...	7	7	8	31
*Hamilton	...	...	...	...	...	..	...	...	...	...	..	..	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ironton	12,952	184	14 21	37	14	27	1	8	...	...	2	2	.	...	..	...	...	11	2	47	2	27	85	6	4	7	4	7	14	4	...	13	20	5	1
Lima	29,058	310	16 67	83	31	78	13	17	1	...	1	2	1	...	2	...	...	4	...	56	8	37	68	5	4	2	...	8	23	7	1	14	98	14	24
Mansfield	17,296	189	10 93	24	12	3	3	3	7	...	...	1	1	...	1	2	...	10	3	22	4	13	97	15	7	1	6	7	24	...	...	10	16	21	5
Massillon	13 781	108	7 81	18	17	23	7	7	1	...	1		...	1	...	...	...	4	...	15	6	9	27	1	4	3	9	...	3	...	...	7	...	7	6
Newark	19,594	202	10 31	32	14	29	7	7	...	...	...	1	...	...	...	...	...	4	1	35	12	21	106	19	13	3	5	4	22	12	...	13	14	19	25
Portsmouth	13 325	222	16.66	33	28	39	7	2	...	1	2	2	...	...	2	...	...	9	2	58	5	26	110	2	4	11	4	5	16	5	...	34	...	15	44
Sandusky	20,888	203	9 72	34	16	43	10	8	...	...	...	...	...	...	...	...	...	12	1	42	12	15	75	2	5	3	3	5	16	6	...	10	37	6	12
Springfield	45,020	433	9.62	59	36	59	12	14	4	...	2	4	2	2	1	4	1	9	...	81	20	51	242	32	25	16	14	14	57	16	5	22	29	22	32
*Steubenville	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tiffin	13,900	133	9.57	16	1	10	...	...	...	...	...	...	...	...	...	...	...	7	...	29	8	17	75	1	11	6	5	8	13	5	...	8	14	6	4
Toledo	120,036	1,564	13.03	358	138	230	3	57	25	8	8	11	16	1	3	5	1	31	9	229	46	137	717	18	33	46	76	36	84	21	...	105	227	111	185
Youngstown	61,333	527	8.59	119	51	136	5	23	...	1	1	...	...	...	2	...	...	28	13	79	19	41	230	12	13	28	20	9	43	13	...	62	24	51	78
Zanesville	23,555	269	11.37	...	...	28		4	...	...	...	...	...	...	...	5	...	18	...	27	...	27	...	...	...	...	...	...	...	...	...	...	...	14	10
Totals	1 510,695	18,385	12.84	3,706	,750	2,716	387	489	126	32	99	93	57	53	24	65	7	456	136	3,230	611	1,918	8,990	532	422	583	700	496	1,255	611	40	1,603	1,949	1,071	1,714

* No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING CITIES OF OHIO, DURING THE YEAR 1898.

Cities of less than 10 000 inhabitants. (census 1890).	Population (estimated)	Total deaths, all causes.	Annual rate per 1 000	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus	Diarrhœal diseases.	Dysentery.	Malarial fever	Measles.	Puerperal fever	Scarlet fever.	Tonsillitis	Typhoid fever.	Whooping cough.
Alliance	11 306	88	7.78	11	7	17	...	3	...	..	3	1	2	...	.	...	.	4	1
Bellaire	11,783	157	13 32	34	31	26	4	3	......	...	..	2	...	...	1	1	...	6	2
Bucyrus	8,516	68	7.98	.....	....	25	1	..	.....	...	...	...	...	..	...	...		3	..
Circleville	7,366	109	14.78	13	...	25		2	8	...		1	...	2	...	.	...	5	...
Defiance	9,395	47	5.00	5	....	18	....	8	....	...	...	...	...	2	2	1	4	1	...
Delaware	9,470	115	12.15	25	20	30	4	5	2	1	.	4	...	..	1	...	1	5	...
Fostoria	12,215	92	7.53	15	4	14	2	4	6	...	...	...	...	...	...	...		2	...
Fremont	6,236	77	12 35	4	7	12	2	1	1	...	...	1	...	...	...	...	...	5	...
Galion	6 939	64	9.22	3	4	6	......	...	1	...	...	1	...	..	...	...	...	...	1
Gallipolis	4,578	146	31.89	11	10	19	3	3	1	1	2	3	...	...	1	...	...	...	..
Greenville	7 815	50	6.39	....	....	3	.	...	.....	...	...	1	...	1	...	...	...	1	...
Kenton	7 340	76	10.36	2	......	12	4	4	.....	...	2	...	...	...	...	...	...	1	...
Lancaster	8,215	119	14.49	11	4	17	1	4	.....	...	5	...	...		...	...	...	3	...
Marietta	11,588	123	10.61	31	11	25	6	5	..	...	2	...	1	...	...	...	...	6	2
Marion	15,280	121	7.92	.	....	38	1	8	4	...	..	...	3	...	...	...	...	7	1
Martin's Ferry	9,268	120	12.95	25	8	15	....	2	4	...	...	...	...	..	...	...	...	3	6
Middletown	11,702	109	9.31	.....	....	16	..	..	1	..	7	1	...	6	..	..	...	..	...
Mt Vernon	6,731	77	11.14	6	3	3	...	2	...	...	...	.	...	...	...	.	...	1	...
Norwalk	8,663	70	8.08	2	1	5	....	1	.	...	2	...	...	...	...	..	..	...	...
Piqua	12,620	112	8.87	10	7	9	4	1	...	...	...	...	...	..	1	.	...	2	...
*Pomeroy	....	...	...	...	..	...	....	...	...	...	...	...	...	...	...	...	...	...	...
Salem	7,696	83	10.79	13	4	5	1	.	2	...	..	1	...	...	...	..	1	..	...
Troy	5,136	79	15.38	3	2	17	2	1	1	...	...	..	...	...	1	...	...	9	...
Urbana	6 723	113	16.81	9	5	9	1	1	2	...	..	...	1	...	...	...	...	2	..
Warren	8,320	90	10.82	16	5	8	....	1		...	2	...	2	...	...	...	...	...	1
Washington C. H	7,992	128	16.02	9	7	7	....		...	...	...	...	...	1	...	...	...	4	...
Wellston	8,000	108	13 50	20	21	39	4	5	6	3	...	1	5	...	...	...	...	2	2
Wellsville	7,464	73	9 78	14	4	21	1	2	1	.	1	...	...	...	...	..	...	3	...
Wooster	5,950	106	17 81	....	.....	13		2	.....	...	...	1	1	...	...	..	...	3	.
Xenia	7,528	104	13.82	....	....	16	2	4	3	...	...	1	1	...	...	...	...	3	...
Totals	251,945	2,824	11.21	292	165	470	43	72	43	5	28	19	16	12	7	2	6	81	16

Cities of less than 10 000 inhabitants. (census 1890).	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Alliance	16	5	7	50	1	2	......	3	2	6	4	...	15	....	5	....
Bellaire	31	5	22	75	3	1	......	5	9	5	6	...	18	18	8	11
Bucyrus	10	......	10	37	....	5	....	...		6	....	...	...	......	......	7
Circleville	34	5	4	44	4	.....	....	1	2	8	....	...	9	....	6	8
Defiance	11	2	8	19	4	.....	3	2	3	3	4	...	...	..	...	5
Delaware	20	5	10	60	10	4	4	5	5	15	5	1	8	..	5	15
Fostoria	31	...	13	42	4	3	2	1	3	11	1	...	2	..	5	3
Fremont	25	2	18	32	7	3	......	...	4	8	3	...	4	2	6	2
Galion	8	2	6	38	8	3	....	2	2	7	1	...	5	2	9	3
Gallipolis	26	5	16	54	3	1	1	6	7	6	4	...	8	....	7	5
Greenville	15	4	11	27	4	1	1	1	3	6	2	...	......	3	1	7
Kenton	29	6	19	19	1	2	......	....	......	7	1	...	2	9	6	2
Lancaster	26	4	22	55	9	8	1	2	7	13	6	..	8	17	4	2
Marietta	24	5	18	59	1	4	2	2	7	9	9		10	11	3	6
Marion	23	4	15	46	3	5	1	......	..	8	....	..	4	5	9	5
Martin's Ferry	23	6	17	48	7	3	3	3	4	14	1	...	13	....	6	6
Middletown	18	4	12	61	8	5	8	1	7	10	4	..	13	8	6	.. ...
Mt Vernon	20	6	12	45	6	2	5	..	4	8	2	...	5	6	3	8
Norwalk	22	5	14	41	10	6	1	......	5	10	1	...	5	....	1	3
Piqua	30	5	21	61	3	4	...	3	2	24	4	...	6	9	3	....
*Pomeroy	.	....	....	....	...	.....		...	....		.....	...	...	.....	.....	....
Salem	32	6	11	43	9	5	4	2	3	12	.....	...	7	2	1	4
Troy	19	5	13	32	7	4	4	..	2	9	1	...	3	9	2	2
Urbana	19	2	11	68	3	2	2	4	1	21	3	1	5	12	5	2
Warren	21	3	11	45	6	3	3	1	....	6	3	...	5	11	5	1
Washington C. H	36	5	29	50	.....	.	...	....	4	8	4	...	4	22	8	5
Wellston	26	1	13	29	......	3	3	3	......	1	.....	...	8	10	4	9
Wellsville	10	....	3	32	3	2	1	4	......	7	1	1	4	....	10	14
Wooster	17	2	12	59	8	5	2	5	5	15	4	...	6	2	5	....
Xenia	42	2	20	37	8	2	1	.....	2	12	....	...	9	5	3	....
Totals	664	106	398	1,308	135	88	52	56	93	275	74	3	186	164	136	130

*No report received.

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING VILLAGES OF OHIO, DURING THE YEAR 1898.

266 villages.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Ada	2,375	12	5 06	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	...	6	3	...	1	...	...	...	1	...	...	1	...	...	4
Addyston	1,500	27	18.66	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	5	13	...	1	...	...	...	8	...	1	1	3	3	2
Alger	500	4	9.00	...	...	2	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	1	5
Anna	910	2	2.20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...	1	...	...	...
Arcanum	1,532	24	15 66	...	...	8	4	1	...	...	...	...	...	...	...	...	...	3	...	4	1	3	12	...	2	...	...	...	1	3	...	1	...	...	1
Archbold	921	4	4.34	...	1	1	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Arlington	600	13	21.66	...	...	7	3	...	...	...	...	...	...	...	...	...	...	4	...	1	1	...	5	...	...	...	...	...	1	...	...	...	...	...	...
Ashland	4,090	41	10.02	...	...	15	...	5	...	...	1	...	1	...	...	...	5	3	...	10	2	5	16	3	...	1	...	1	7	...	...	2	...	...	...
Ashley	771	2	2.58	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...
Ashville	800	15	18.75	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Athens	2 796	44	15.74	6	8	7	...	...	...	...	...	...	...	4	...	...	...	3	...	3	1	2	27	4	1	...	...	...	11	1	...	1	...	5	2
Bainbridge	1,000	12	12 00	4	...	3	...	...	...	...	2	...	...	...	...	...	...	1	...	2	1	1	4	...	...	...	...	...	2	1	...	1	2	1	3
Bakersville	400	4	10.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	3	1	...	...	...	...	...	1	...	...	...	...	...
Barberton	3 000	19	6.33	4	2	4	...	1	...	...	...	...	...	1	1	...	...	...	...	2	...	1	10	1	1	...	1	1	1	...	...	1	...	3	2
Barnesville	3,997	49	12.26	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	4	1	3	3	...	...	...	...	...	3	...	...	...	...	2	2
Barnhill	969	2	2.07	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	1	...	...	1	...	...	...	...	...
Batesville	406	4	9.85	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	2	...	1	...	...	...	1	...	...	...	...	1	1
Bedford	1.335	15	11 24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	7	2	...	...	...	...	2	...	...	3	...	3	...
Bellefontaine	4 452	45	10.11	5	4	4	...	3	...	...	...	1	...	...	...	...	...	...	...	12	1	3	26	5	2	1	...	2	7	1	...	3	...	3	3
Bellevue	4,009	43	10.73	6	4	10	4	...	...	...	...	...	...	...	...	...	...	1	...	4	1	3	2	...	...	...	...	...	2	...	...	...	1	...	6
Belmont	445	19	42.69	1	...	15	...	5	...	...	4	...	2	1	1	...	...	2	...	1	1	...	3	...	2	...	1	...	...	...	...	...	...	...	...
Benton Ridge	326	3	9.20	...	2	2	...	1	...	...	...	...	...	...	...	1	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Berne	200	1	5.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...
Blake Mills	390	4	10.26	...	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Bloomingburg	744	15	20.16	2	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Bond Hill	1,000	12	12.00	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	3	...	1	6	1	1	...	...	1	1	...	...	2	2	...	1
Bowersville	450	4	8.88	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...	...	...	1	...	...	...	...	...	...
Bowling Green	6,639	24	36.15	...	...	14	2	3	...	...	...	...	...	...	...	4	...	5	...	8	3	5	2	...	...	...	...	...	...	...	...	...	...	...	1
Bradford	1,650	13	7 88	...	...	3	...	...	1	...	...	1	...	...	...	...	...	...	...	5	...	2	3	1	...	...	...	...	1	...	...	...	...	2	...
Brainer	1,200	8	6 65	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	2	1	1	1	...	...	...	1	...	...	...	...	...	...	...	...
Bridgeport	4 426	40	9.01	7	8	14	1	6	...	...	2	...	...	...	...	...	...	5	...	8	2	3	7	...	1	...	1	...	1	1	...	...	5	4	...
Brooklyn	5,000	26	5 20	...	...	6	...	...	...	...	...	1	1	...	...	...	...	3	...	1	...	1	14	...	...	1	2	...	6	...	2	3	...	...	2
Bryan	3,164	39	12.33	...	3	9	4	2	...	...	...	1	...	...	...	...	...	1	...	8	1	5	16	2	1	...	...	1	6	...	...	4	1	4	2

Caldwell	2,236		1.79	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	1	1	...	...	...	...	...	...	...	...	...	1	1
Caledonia	880	4	4.55	...		3	1	...			...	...	...	...	...	...	...	1	...	1		1	...	...	...		...	...	...	...	...	...	...	...	...
Cambridge	6.072	83	13.67	13	4	27	4	8	...	...	3	...		...	...	...	...	8	...	18	3	15	35	7	...	1	3	5	6	1	...	3	1	2	6
Canal Dover	4 981	1	.20	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Canal Fulton	1,155	20	17.32	...	...	...	...	...	...	...	...	...	...		...	...		...	...	...	...		1	...		...	...	...	...	...	...	1	...	...	...
Canfield	695	6	8 63		...		...		...	...	...	...	...	...	...	...	...	...	...	1	...	1	5	1	...	...	...	1	...	...		1	...	...	...
Carey	2,093	19	9.06	1	...	1	...	...	...	...			...	...	...	...	...	...	...	8	2	5	10	2	...	...	...	...	3	...		2	...	...	1
Carrollton	1,306	8	6.13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2		2	6	2	...	...	...	1	1	...	...	2	...	...	3
Carthage	2,400	24	10.00	...	...	2	...	1	1	...	...	...	...	...	...	...	...		...	6	3	3	15	...	2	...	7	1	2	...	...	1	...	1	...
Casstown	264	3	11.37		...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	2		...	1			...	...	...	...
Cedarville	1,508	27	17.90	4		15	1	4	...	...	...	...	...	...	...	...			...	5	...	2	5	...	...	...		...	3		...	2	...	2	...
Celina	4,718	39	8 47	12	7	17	2	4	3	1	...	...	...	...	1	...	...	2	...	7	3	3	11	...	1	...	...	3		...	...	5	4	...	10
Centerburg	800	5	6.25		...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	5	1	1	...	...	...	3	...	...		...	...	1
Chagrin Falls	1,269	3	2.37	...	...	3	...	...	...	...	...	...	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...
Chatfield	309	1	3.33	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...
Chicago	2,227	22	9.88	...	...	7	...	1	1	1	...	1	...	...	...	...	...	1	...	5	1	4	7	...	...		1	1	2	1	1	1	1	2	...
Clyde	2,285	52	22.76	4	...	6	2	2	...	...	...	...	...	...	...	...	...	...	...	12	2	7	23	2	1	...	1	...	3		...	4	6	5	2
Collinwood	3 300	42	12.73	6	3	6	1	1	...		2	...	...	...	...	...	...	...		8	...	7	24	3	1	1	1	1	2	1	...	1	...	4	2
Columbiana	1,030	20	19.42	...		2	...	...	...	...	...	...	...	...	...	1	...	1	...	5	2	2	12	2	1	...	...	3	...	1		5		1	6
Commercial Point	300	2	6 66	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...		...	...		...	...	...	...	...	...	...	1
Conneaut	6,9 8	68	9 83	21	2	13	3	2	1	...	1	...	...	...	...	...	...	3	...	10	3	5	22	3	1	1	4	1	5	...	...	7	...	6	2
Corning	1.000	11	11.00	1	3	7	...	...	1	...	...	...	...	3		...	...	3	...	2	1	1	2	...			...	1	...		...	1		...	...
Coshocton	4 .66	52	12.19	10	3	10	1	1	...	...	...	...	1	1	...	1	...	4	...	7	2	4	25	5	2	2		2	6	1		2	8	2	14
Covington	2 083	16	7.68	2	...	2	...	1	...	...	...	...	...	...	...	...	...	...	1	5	3	2	7	1	...	...	1	...	2	...	...	...	1	1	1
Cridersville	740	7	9.47	2	...	2	...	1	...	...	...	...	...	...	...	...	...	...	...	2	1	1	3	...	...	...	1	...	1	...		...	...	...	1
Crooksville	1,000	14	14 00	...	...	4	...	...	1	...	...	2	...	...	...	...	...	1	...	...	...	...	4	...	...	1	...	...		...	...	1		...	6
Cumberland	675	4	5 93	...	...	1	...	...		...	...	...	...	...	...	...	...		...	...	...		2	2	...	...		...	...	...	...	...	1	...	...
Cuyahoga Falls	2,901	37	12.75	1	...	4	...	1	...	...	...	1	...	...	...	...	...	2	...	6	2	4	17	1	...	2	...	1	6	...	...	7	6	1	4
Dalton	731	8	10.94	...	...	1		...	...	...	...	1	...	...	...	...	...	...	...	2		2	5	...	1			...	2	1	...	1	...	...	2
Darbyville	400	11	27.50	...	...	4	1		...	...	...	...	...	3	...	...	...	...	...	7	...	3		...	...	...	...				...		...	...	...
DeGraff	1,173	4	3 41	...	...	1	...	1	...	...	...	...	...	...	...	...	...		...	...	...	...	3	...	1		...		1	...		1	...	...	1
Delta	1 411	15	10.63	2	...	2	...	1	...	...	...	...	...	...	...	1	...	...	...	3	3	...	4	...	...	1	...	...	1	1	...	...		...	...
Dennison	4,933	50	10.14	...	...	15	3	4	2	...	...	2	1	...	2	...	...	1	...	8	2	6	20	2	...	...	3	3	7	...	...	...	...	4	3
Doylestown	1,209	5	4.72	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	5	3	...		...	...	1	...	...		...	...	...
Dublin	282	8	28.40	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	5	1	3	2	...	...	...		1	...	...	...	1	...		4
Dunkirk	1,151	2	1.74	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...		...	...	...	...	...	...	...	...	...	7
East Cleveland	2,200	11	5.00	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	10	2	1		...	...	3	...	...	1	...	...	1
East Palestine	1,963	14	7 13	4	...	3	...	...	...	...	...	...	...	...	...	...	...	1	2	4	...	3	4	...		...	2	...	...	...		2	2	1	1
Eaton	3,772	25	6 63	...		8	1	...	...	...	...	...	...	...	...	...	...	7	...	2	1	1	9	2	3	...		...	1	...	...	...	3	3	...
Elida	498	11	22.08	1	2	3	1	1	...	...	...	...	1	...	...	...	...		...	2	1	1	3	...	2	...	...	...		...	...	1		...	...
Elmore	1,336	4	3.00	1	...	3		1	1	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...			...	...	...	1
Elmwood Place	2,500	18	7.20	...	...	3	...	...	1	...	...	...	...	...	...	1	...	1	...	2	...	2	6	...	1	...	4	...	2	...	...		4	3	...
Enon	308	4	13.00	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...		...	...	...	...	...	...	...	...	...	...	1	...	...
Fairport	1,500	49	32.66	...	7	11	...	8	...	...	...	...	...	...	...	...	...		3	13	...	8	20	...	...	...	2	2	...	2	...	6	3	2	1
Fairview	400	2	5.00	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	1	...	...	...	...		...	...	...		...	...
Fayette	1,255	7	5 58	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	5	1	...	...	...	...	2	...	...	...	...	...	...
Felicity	614	6	9.77	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	5	...	4	1	...	1	...	...	...	...	...	...	...		...	...
Franklin	3,039	38	12.50	5	...	3	...	...	...	...	...	...	...	...	...	...	...	3	...	10	1	7	15	3	...	...	3	...	1	2	...	1	8	2	1
Frazeysburg	733	6	8.19	1	1	3	...	1	...	...	...	...	...	...	...	2	...	...	...	3	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Fredericksburg	643	1	1.55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	1	...
Fredericktown	844	8	9 48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	6	2	...	...	...	...	...	...	...	...	...	...	...
Gahanna	306	15	49.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geneva	2,458	45	18.31	5	1	9	1	5	...	...	...	1	...	...	1	...	...	1	...	10	1	7	22	2	2	...	...	...	6	...	...	2	...	4	1

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING VILLAGES OF OHIO, DURING THE YEAR 1898.

166 villages	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Germantown	1,306	14	10.72	...		2	...	...	...	...	...	...	...	...	...	...	...	1	...	4	...	4	8	...	...	1	...	...	3	...	...	...	...	...	1
Girard	3,000	26	8.66	5	3	6	1	2	...		1	...	...	...	...	...	...	...	1	1	...	1	17	3	3	...	...	1	3	...	...	3	1	1	...
Glendale	1,480	23	17.57	8	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	12	...	5	8	1	1	...	...	...	...	5	...	1	...	2	...
Glenville	5,200	52	10.00	5	6	4	1	...	...	...	...	...	...	...	...	...	...	2	1	11	4	7	18	1	1	...	3	...	7	1	...	5	...	3	5
Glouster	3,000	15	5.00			2	1	...		...	...	...	...	...	...	1	...	...	...	2	...	1	9	1	.	...	...	1	3	...	...	4	...	...	2
Grafton	600	15	25.00	1	4	1	...	...	...	...	...	...	...	...	...	...	...	1	...	3	...	2	6	1	1	...	...	.	2	...	...	2	...	2	1
Grand Rapids	883	6	6.79		...	2	...	...	...	...	...	...	...	...	...	...	...	1	1	2	...	1	1	...			...	...	...	...	...	.	...	1	...
Green Springs	1,097	16	14.59	4	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	1	...	...	13		2	...	.	...	...	...	...	3	...	...	...
Grove City	800	10	12.50	.	...	2	...	1	...	...	...	...	...	...	...	...	...	...	...	2	1	1	4	1	...		...	2	...	...	...	...	...	2	...
Hamden Junction	717	10	13.95	...	1	3	...	...	...	...	...	...	...	...	1	...	...	...	...	2	...	1	4	...		...	...	...	...	1	1	...	...	1	...
Hamler	1,122	3	2.67		1	2	...	1	...	...	...	...	...	...	...	...	...	1	...	1	.	1	...		...		...	...	...	...	...	...	...	...	1
Hanging Rock	1,054	13	12.33	...	7	9	2	2	3	.	...	...	...	...	...	...	...	2	...	1	.	1	2	...		...	...		2	...	...	...	...	...	1
Hanoverton	277	2	7.22	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1			.		...	...	...	...	...	...	...
Hartwell	2,293	30	13.09	3	2	2	...	1	...	...	...	...	...	...		...	...	...	...	11	3	4	17	2	1	...		3	3	1		4	.	...	1
Hicksville	3,372	19	5.63	...	...	7	...	4	...	...	...	...	1	1	..	...	...	1	...	4	1	2	7	1	2	...	...	1	2	...	...	1	...	1	1
Hillsboro	3,961	40	10.10	...	...	4	...	2	...	...	...	...	...	...	...	.	...	...		8		4	20	1	3	3	...	...	5	1	...	5	5	3	...
Hollansburg	500	11	22.00	1		...	.	...	...	...	...	...	...	...	...	...	...	...	...	4	.	4	6	...	.	...	...	...	3	1	...	2	...	...	...
Holmesville	400	5	12.50			5		...	...	...	...	...	1	...	...	3	...	1	...	...		...	...			..	...	...	...	...	...	..	...	...	...
Hopedale	432	26	60.19	...	...	3	.	...	1		...	1	...	...	...	...	...	...	...	6	2	1	12	2	2	...	...	1	3	...	...	2	2	3	10
Hubbard	1,487	17	11.43	1	..	1	..	..	...	...	.	...	1	.	...	...	...	...	...	3	...	1	11	2	...	1		2	2	...		3	1	1	...
Hudson	1,100	10	9.99	...	..	2	...	...	..	...	...	...	...	...	...	1	...	...	...	4	1	2	4	...	...	...	..	..	2		...	1	1	..	...
Huntsville	565	8	14.16	...	2	4	...	..	...	...	...	...	...	...	...	2	...	...	...	...	...	..	...	...		.	..	...	...		...	...	4	...	...
Huron	1,733	13	7.50	3	...	4	...	1	1	...	...	...	...	...	1	...	...	...	...	3		3	2	..	1	...	...	...	1	...	...	...	...	1	...
Hyde Park	1,600	11	6.88	1	...	2	1	...	...	.	...	...	...	...	...	...	...	1	..	3	1	2	4	...	1	..	...	...		2	...	...	1	...	...
Jackson	5,750	73	12.70		..	16	6	4	3	...	...	...	...	...	...	...	...	2	...	19	2	17	29	...	6		4	1	14	2	...	2	2	7	3
Jacksonville	1,000	3	3.00		...		...	..	...	..	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...		...	...	.	...	...	...	3	...
Jerry City	1,055	5	4.74	1	...	2	...	...	1	..	1	...	...	...	...	...	...	...	...	1	...	1	1	1	...	...	...	...	...	...	...	...	1	...	...
Junction City	500	12	24.00	..	1	5	..		1	...	...	...	...	...	1	...	...	1	...	2	1	1	4		...	...	...	1	1	1	...	...	...	...	3
Kent	3,631	42	11.47	12	..	14	3	6	2	...	...	...	...	...	...	...	1	1	...	9	3	5	15	1	...	...	3	2	4	...	...	1	3	1	3
Killbuck	500	1	2.00			...	...	.	...	...	...	...	...	...	...	...	...		...	...	.	...	...		...	...	...	..	...	...	...	...	...	1	...
Kingston	1,147	5	4.36	...		...	..		.	...	...	...	...	...	...	...	.	...	...	3	2	1	2	...	...	...	...	...	1	...	...	1	...	..	...
Kirby	350	3	8.57		...	...	...	...	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...			...	...	...	...	...	...	...	...	...	...
Kossuth	200	2	10.00	1	1	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...
Lakewood	3,000	7	2.33	...	...	1	...	...	...	...	...	...	...	1	...	...	...	.	...	3	1	2	3	...	...	...	...	...	2	1	...	...	...	...	...

Lebanon	3,359	34	10.12	3	1	3						1								9	2	6	22	1				1	5	1		3			3
Leetonia	3,066	28	12.40	7	5	16	3	1					1					3	1	5	2	3	14	1	1		1	2	2			2		3	2
Lewisburg	557	5	8.98			1														1		1	3	1	2										
Lewisville	250	1	4.00																				1												
Lexington	379	7	18.47																	3		1	2			1									1
Lockington	300	2	6.66	2		2		2																											
Lockland	3,076	38	12.35	6	3	5			1		1					1		2		3	2	1	14			2		3	4	2		3		1	
Logan	3 579	41	11.45	4	4	10	1	1	3					1				2	2	9	2	7	17	2		1		2	5	1		3	4	1	1
Lorain	11 863	140	11.80	28	10	30	7	10			1	5		1	1	1		2		13	2	11	37	4	2		3	6	6	7		6	13	14	20
Loudonville	1,403	17	12.12			5												2		6	2	1	6					1		2		1			
Louisville	1,591	24	15.09			4		1	1						1			1		6	3	3	14	2					1	2					
Lynchburg	852	8	9.40	2	1															1		1	7						1			3			
Magnolia	400	5	12.50			2	1		1											1	1		1						1					1	
Marysville	3,600	26	7.22			4		1										2		7	1	5	11		1	1			5			1	1	2	1
Mason	699	11	15.74			2	1											1					9						2			2			1
Maumee	1,544	20	12.95			6	5		1											2	1	1	12		1			1	4						
McComb	2 123	14	6.60	1	1	2														5		4	5	1				1	1			2		2	
McConnelsville	2.052	20	9.75	1		2												1		15	2	7	1				1							2	2
Mechanicsburg	1,410	30	21.27	2		3	1				1									10	2	7	16		1							5		1	
Melrose	450	5	11.00			2	1													1		1	2						1			1			
Mentor	473	2	4.23																				2						1			1			
Miamisburg	4,137	52	12.57	11	5	11	2	2				3		1				1	1	11	2	9	29	3		2	2	1	13	3		4		1	2
Middleport	3,361	52	15.47	7	7	10	3	1			1			3				1		27	3	10	10	1	3				1	2			3	2	
Milford	1,271	12	9.44			1	1													6	2	3	3						2						2
Milford Center	974	9	9.24	1	1	2		2												3		3	2	1					1					2	1
Millersburg	2,0 4	30	14.90	3	3	15	5					1	1							7		4	5		1				4					1	2
Mineral Ridge	668	8	11.98			8	2						1		1	1		2																	
Mingo Junction	2,468	20	8.31	3	2	4												4		1			8				2					6		6	3
Montpelier	3 265	18	5.51	1		2		2												6		4	3					1	1					4	2
Mt. Washington	800	11	13.75			3						1							1	2	1		6					1	5						
Murray City	1,050	8	7.62	2	2	3		1						1						3	1	2	2						1			1		1	3
Napoleon	2,567	26	10.50		1	5					1				1			2		4		4	16	3	3			2	3	1		1		1	
Navarre	1 000	13	13.00			4		3															5									4	1	1	1
Nelsonville	6,212	66	10.62	15	7	19	4	4		1	1				1			2		13	3	4	27	1		1		4	5	1				7	4
Nevada	653	6	9.19	2	1	2	1	1												1		1	3	1	1				1						2
New Athens	456	6	13.16																	4		4	2		2										
New Bremen	1,297	12	9.28			2														4	1	3	5					1	1					1	
New Carlisle	1,087	6	5.52	1	1	1														1		1	2							1				2	2
New Holland	760	8	10.53			3		2										1		3	1	2	2		1				1						
New Lexington	1,567	22	14.05			1												1		3		3	18		1				2			2			
New London	1,169	20	17.11			5			2				1							3	1	1	11	1					5			2		1	2
New Matamoras	559	13	23.26	3																			10		2				1						
New Paris	847	11	12.99	1		2			1														7	1	2							1	1	1	
New Philadelphia	6,003	81	13.49	5	1	18	2	1	2			3						2		23	12	11	37	5	5	3		2	11	3		1		3	4
New Richmond	2,251	14	6.21	1	4	8								5				3		1		1	4		1			1	1			1		1	3
New Riegel	300	8	26.66			1														2		1	4						1	1		1		1	1
New Straitsville	2,782	18	6.47	1																9	2	1	4						1	1		2	3	1	2
Newton Falls	815	8	9.82			1		1												2	1	1	5	1	2			1	1						
New Vienna	935	9	9.63																	6		1	1			1							1	1	
New Washington	728	9	12.56	1																1			7		1				3						
Ney	450	7	15.55	2		2		2															5		2				1			2			1
Niles	4 647	91	19.60	7	4	15		8	2											7	1	6	12					1	4		1	6		3	
North Amherst	1,737	18	10.36	2		4	1	1										1		4	3	1	6				1	1	3			2	2	2	2

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING VILLAGES OF OHIO DURING THE YEAR 1898.

266 villages.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
North Baltimore	3,200	33	10.31	8	1	7	....	2	...	...	...	...	1	...	1	...	...	1	...	5	1	3	19	....	1	1	....	2	4	....	....	1	....	2	4
North Lewisburg	835	18	21.56	2	1	5	...	1	...	...	...	1	...	...	...		...	1	...	4	2	1	8	1	1	1	....	1	2	....	....	1	1	....	....
Norwood	8,000	61	7.62	16	3	15	....	...	2	...	1	2	...	...	...	...	...	5	1	6	....	4	34	1	....	1	4	4	7	2	....	12	3	3	7
Oak Harbor	2.573	4	1.17	....	....	3	..	2	...	...	...	...	...	...	...	...	...	1	...	....	...	....	1	....	....	....	...	....	....	..	....	1	....	....	2
Oberlin	5 562	61	10.97	2	2	5	..	....		...	1	...	...	...	...	...	...	3	...	28	7	12	28	3	2	1	....	1	11	..	....	1		....	....
Ohio City	900	14	15 55	4	4	8	....	....	...	...	...	...	...	...	...	...	...	...	...	2	....	2	2	1	..	1	....	....	....	..	....	....	...	2	....
Olmsted Falls	299	6	20.07	....	...	....	....	....	...	...	...	...	...	...	...	...	...	....	...	1	...	....	5	1	....	....	....	....	....	....	....	....	...	....	....
Orrville	2,075	35	16.87	5	2	7	...	3	.	...	...	2		...	...	...	...	1	...	4	1	3	11	1	1	....	2	1	4	..	....	2	9	2	2
Osnaburg	600	33	55.00	....		8	3	4	...	.	...	...	...	...	...		...	..	...	11	....	7	13	1	2	1	1	....	4	1	....	3	....	1	4
Ottawa	1,923	31	17.70	1	2	7	....	2	...	...	1	...	...	1	...	...	...	1	1	8	2	5	17	3	4	...	2	4	....	...	....	4	1	2	....
Otway	350	2	5 70	....	1	....	.	....	...	...	...	...	...	...	...	...	...	....	...		...	....	...	....		....	...		....	....	....	....	....	2	....
Painesville	5,640	79	14 01	11	...	17	2	3	...		...	4	.	...	.	...	...	2	...	12	4	8	33	5	3	....	2	....	2	...	....	3	11	6	4
Patterson	300	2	6.66	....	....	....	....	....	...	...	...	...	...	...	...	...	...		..	...	....	...	2	....	1	..	....		....	....	....	1	....	....	....
Payne	1,500	12	8.00	....	....	8	1	4	...	...	...	...	...	.	...	...	..	2	...	....	...	....	3	....	1	....	....	1	....	....	....	1	....	....	4
Pemberville	1,045	6	5.74	1	1	3	....	....	1	....	.	...	...	...	...		..	2		2	....	2	1	1	....	...	....	....	..	..	..	....	....	....	1
Perrysburg	1,627	20	12.29	....	....	3	....	....	...	...	...	...	...	..	1	...	...	2	...	4	1	3	7	1	....	....	....	....	3	...	..	....	5	1	....
Plain City	1,602	9	5.62	....	....	2	....	....	...	..	...	...	...	.		...	...	2	..	1	....	1	4	....	....	....	....	....	1	2	....	1	....	2	....
Plainfield	191	5	26.17	....	..	....	....	....	...	...	...	..	...	...	...	...	...		...		....		....	....	....	..	....	..	. ..	....	....	....	....	....	....
Pleasant Hill	574	14	24.40	....	..	1	....	....	...	...	1	...	...	...	...	...	...	..	...	6	1	3	7	..	....	....	....	...	.	....	....	1	...	...	1
Pleasant Ridge	1,250	8	6.40	....	....	....	....	....	...	...	...	...	...	...	...	...	...	...	...	1	....	...	5	...	...	....	..		....		..	....	1	1	....
Pleasantville	743	2	2.69	....	....	1	....	....	...	...	...	...	...	...	...	1	.		.	....	...	...	1	....	....	....	....	....	1	....	....	....	....	....	1
Poland	348	8	23.00	....	...	1	....	....	...	...	...	...	...	...	...	...	...	...	1	2	1	....	4	...	.	....	.. ..	....	3	....	....	1	....	1	....
Polk	218	5	22.94	....	...	1	....	....	...	...	...	...	...	...	...	1	...		...	1	....	1	2	1	....	....	....	....	1	....	....	....	....	1	....
Portage	586	1	1.70	....	....	1	....	....	1	...	...	...	...	...	...	...	...	. ..	...		....	...	....	....	.	....	....	....	....	....	...	....	...	....	2
Port Clinton	2,300	32	13 91	6	4	4	....	1	...	2	1	...	...	..	..	...	...	...	...	6	1	4	11	....	....	....	. ....	1	3	2	....	2	9	2	....
Port Washington	394	11	27.92	....	....	....	....	....	...	...	...	...	...	...	...	...	...	....	...	5	2	3	5	....	1	1		....	2	....	. ..	....	....	1	5
Port William	208	2	9.62	....	....	2	1	....	...	...	...	..	.	...	...	...	..	1	...	.	....	..	....	....	...	....	....	....	....	....	....	....	....	....	....
Powhatan Point	600	5	8.33	....	....	2	....	....	1	...	...	...	...	...	...	.	...	1	...	1	....	1	2	....	1	1	....	....	....	....	...	....	....	...	1
Ravenna	3,467	27	7.78	....	....	2	....	1	...	...	...	...	...	...	...	...	...	1	...	8	3	5	12	2	1	....	....	....	7	....	....	1	1	2	2
Rawson	8 2	5	6.23	1	....	1	....	....	...	...	...	...	...	...	...	...	...	1	...	2	...	1	2	....	...	...	....	....	....	....	...	1	....	....	....
Reading	3,488	31	8.89	4	1	5	....	2	1	...	...	..	..	...	...	...	...	....	...	6	....	4	15	2	1	2	3	2	....	....	...	3	2	2	6
Republic	496	9	18.15	....	....	....	....	....	...	...	...	...	...	...	...	...	...	....	...	2	...	1	6	....	...	....	....	....	1	....	...	1	....	1	....
Reynoldsburg	408	16	39.22	1	....	6	5	....	...	...	...	1	...	...	...	...	...	....	...	3	....	1	6	....	2	....	1	....	2	....	....	1	....	....	1

Ridgeway	305	3	9.84			1	1													1	1		1						1						
Rochester	203	2	9.85																				1		1								1		
Rocky Ridge	525	2	3.81			1											1			1															
Rogers	500	2	4.00	2																															
Roseville	1,500	7	4.66			3	1	1										1					1					1						2	
Rushville	354	4	11.30			2	1		1														2												
Sabina	1,435	16	11.15	3		1							1							4	1	3	8				1	2	5						1
St. Bernard	2,771	31	11.19	2	2	4				1		3	1					1		8	1	7	12		1	1		1		3		3			5
St. Mary's	4,627	78	16.86			35		20	4	8		5	2	5	0			3	2	7	2	3	36	2	5		7	4	5	2	1	10			
Salesville	322	3	9.32																	2		2	1		1										
Salineville	2,424	23	9.49	3	2	4		2				1								3	1	2	11	2	1		2		2			2	3	2	1
Scott	400	9	22.50	4		4		1				3								1		1	4		1				8						
Senecaville	514	5	9.72	3		1		1															4						1	1					
Shelby	2,066	56	27.11	7	5	6		3										2		4	2	2	16	2	1	1	2		5	3		2	18	8	4
Shreve	1,103	13	11.79		1	2							1							3	1	2	7		1				2			2		1	
Sidney	5,674	71	12.51	4	4	11		1	3						1			2		16	6	10	31	2	4		2	1	8	5	1	3	9	4	5
Smithfield	711	10	14.07	1	1	2			1									1					1		1								4		
Smithville	436	5	11.47	1		1														1			2		1	1									1
Somerset	1,066	9	8.44			2	1	1												5		4	2						2						
South Bloomfield	249	6	24.09			2						2											3					2	1				1		1
South Charleston	1,137	9	7.91		1	1												1		1			6	1					1						2
Spencerville	2,533	27	10.66	1	2	7	4				1									8	1	7	7		5		1	1					2	2	
Springboro	327	8	24.47	1		1		1															4	2				1	1				8		1
Spring Valley	716	4	5.59	1																1		1	3						2			1			
Sugar Grove	285	3	10.53	1		1			1											2	1	1													
Summerfield	734	4	5.45																	8			1							1					
Swanton	708	7	9.89	3	1	1								1									4					1	1			1	2		
Sycamore	1,576	2	1.27																															2	2
Sylvania	563	6	10.66																	1		1	5	1			1		1			2			
Taylorsville	758	3	3.83																				3		1				1			1			2
Thornville	561	5	8.91																				5	2					1			1			
Tippecanoe City	1,508	20	13.26			2		1	1											4	2		9		1		1	1	2				2		
Tontogany	102	6	58.82	2																			4		2										
Tuscarawas	600	3	5.00																	2	2												1		
Uhrichsville	4,962	36	7.26	5		7	1	2			1							3		14	3	6	12	2	2			1	6	1				8	8
Union City	1,443	14	9.70	2	3	3		1	1									1		5		4	4		1			1	1				1		1
Utica	815	7	8.59																				5										1	1	
Versailles	1,592	17	10.68	3	1	2					2									8	3	1	7						5	2					
Wapakoneta	4,481	26	8.04		2	5												1	1	7	1	6	12					1	5				7	2	2
Washington	506	13	25.49		1	3												3		4		3	5	3											1
Washingtonville	1,200	21	17.50	2	3	5		2	1			1						3		3	2	1	6	1	1	1	1	1	1				5	2	
Waverly	1,549	47	30.34			2	2																10		2		1		5	1		1			
Waynesfield	689	4	5.81			1	1													1		1	2	1											8
Waynesville	640	15	23.44																	2		2	13	2		1		1	2	2					
Westerville	1,494	18	12.05	4		8		3												3	1	2	5						1			2			1
West Jefferson	827	1	1.21			1	1																												
West Leipsic	530	1	1.90		1	1	1																												
West Liberty	1,500	13	8.66	1																1		1	8						5	1			4		1
West Manchester	300	9	30.00	3	2	3		1	2														3		1				1	1			2	1	1
West Mansfield	528	4	7.57	1	1															2	1	1	2					1		1					
West Milton	894	9	10.07																	1	1		8		1				4			1			1
Williamsport	418	6	14.35																	5		5	1						1						

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING VILLAGES OF OHIO, DURING THE YEAR 1898.

266 villages.	Population (estimated).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pnuemonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Willoughby	1,427	36	25.28	......	......	4	......	......	...	...	...	1	...	1	...	...	...	1	...	2	...	2	13	1	2	......	......	......	6	......	......	4	......	1	......
Wilmington	3,376	48	14.22	....	2	5	......	1	...	...	...	2	...	...	2	...	...	......	...	14	3	11	22	6	......	......	....	2	5	6	....	3	4	3	1
Winchester	1,865	11	5.90	......	.....	2	......	1	...	...	...	...	...	...	1	...	...	......	...	3	......	1	6	......	...	......	......		....	......	...	......	......	......	1
Windham	900	8	8.88	......	......	......	......	......	...	...	...	...	...	...	...	...	...	......	...	2	......	2	4	......	......	......	....	......	2	......	......	......	......	2	...
Winton Place	1,200	17	14 17	8	3	2	....	1	1	...	...	...	...	...	...	...	...	......	...	3	1	1	10	......	......	3	......	......	1	......	......	1	......	2	2
Woodstock	310	6	19.35	......	....	1	......	...	...	...	...	...	...	...	...	...	...	1	...	1	......	1	3	1	....	......	......	.. .	1	......	......	1	....	1	......
Wyoming	1,800	13	7.22	3	1	1	......	......	...	...	...	...	...	...	...	1	...	......	...	3	......	1	9	....	......	......	1	1	1	2	......	....	......	......	4
Zoar	250	4	16.00	....	......	2	......	.	...	...	...	1	...	...	...	...	1	.. ..	...	1		1	1	.	......	......	1	.	......	......	....	......	....	......	......
Totals	448,201	4,764	10.75	140	210	980	125	223	68	11	37	54	21	38	34	26	9	180	22	979	202	570	1,901	175	156	49	96	120	468	103	8	278	226	256	322

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING TOWNSHIPS OF OHIO, DURING THE YEAR 1898.

864 townships.	Population (census 1890).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever	Scarlet fever.	Tonsillitis.	Typhoid fever	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still births.
Adams—																																			
Franklin	1,594	11	6.90	...	...	5	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...	2	4	2	...	...	...	...	...	...	...	2	...	...	...
Scott	1,182	5	4.23	1	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	3	...	...	...	...	...	3	...	...	...	...	...	1
Allen—																																			
Richland	1,747	2	1.14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	...	...	...	...	1	...	...	...	...	...	...
Ashland—																																			
Green	1,448	30	20.72	8	...	6	1	2	1	...	...	...	...	...	...	...	...	2	...	9	...	6	13	1	1	...	...	1	5	1	...	1	1	1	4
Milton	1,043	6	5.75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	1	...
Perry	1,236	4	3.24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	2	...	...	...	...	...	1	...	...	1	...	...	...
Sullivan	724	9	12.43	...	1	3	...	1	...	...	...	...	...	...	...	1	...	1	...	2	...	2	4	...	2	...	...	...	1	...	...	1	...	...	1
Ashtabula—																																			
Andover	786	16	20.36	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	12	1	...	...	...	...	4	...	...	...	...	1	...
Ashtabula	1,908	2	1.05	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...	...	...	...	...	...	...	...	...
Cherry Valley	677	14	20.68	1	1	3	...	2	...	...	...	...	...	...	1	...	...	...	...	6	1	2	5	...	1	...	1	1	1	...	...	...	...	...	1
Denmark	749	7	9.85	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	2	1	...	...	...	...	1	...	...	...	...	2	...
Dorset	668	8	4.50	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2	1	...	...	...	...	1	...	...	...	...	...	...
Kingsville	1,712	16	9.35	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	5	3	2	4	1	2	...	...	...	1	...	...	...	...	...	...
Lenox	724	9	12.43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	...	...	...	2	...	...	...	5	1	...
Morgan	567	4	7.06	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	1	2	1	...	...	...	...	...	...	...	1	...	...	...
Richmond	912	10	10.86	...	...	3	...	...	...	...	2	...	...	...	1	...	...	...	...	2	...	2	5	2	...	...	...	...	2	...	...	...	...	...	...
Saybrook	1,513	2	1.32	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trumbull	855	8	9.36	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	3	2	1	4	1	...	...	...	1	...	...	...	2	...	...	...
Wayne	755	10	13.25	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	...	...	...	...	...	...	...	1	8	...	...
Athens—																																			
Ames	1,281	2	1.56	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bern	1,485	2	1.85	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carthage	1,240	8	6.05	...	...	2	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	1	5	...	...	...	...	...	1	...	...	1	...	...	...
Dover	1,880	5	2.66	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	2	1	...	...	...	...	1	...	...	...	1	...	4
Lodi	1,890	2	1.44	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Auglaize—																																			
Clay	1,430	6	4.20	...	...	2	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...
Jackson	840	13	15.48	2	3	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	12	1	1	...	...	...	1	...	...	6	...	...	...
Washington	1,581	20	12.70	1	1	2	...	...	...	...	...	...	...	...	...	...	...	1	...	2	1	...	1	...	...	...	...	...	1	...	...	...	...	1	2

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING TOWNSHIPS OF OHIO DURING THE YEAR 1898.

362 townships.	Population (census 1890).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Belmont—																																			
Flushing	1,614	1	.62	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...
Pe ıse	3,275	1	.31	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wayne	1,704	15	8.80		...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13	...	...	...	...	...	1	...	...	2	...	...	...
Brown—																																			
Byrd	1 216	10	8.23	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	3	2	...	6	1	1	1	1	...	1	...	...	...	...	...	...
Huntington	2,093	3	1 48	...	...	2	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Jefferson	724	6	8.29	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	4	1	...	...	...	1	...	...	...	...	...	...	...	...
Pleasant	1,537	14	9 11	...	...	2	...	...	...	...	1	...	...		...	...	...	...	...	5	1	1	7	...	...	...	...	...	...	...	...	...	...	...	...
Butler—																																			
Fairfield	2,445	12	4.91	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	7		...	...	...	2	2	...	...	2	3	1	2
Hanover	1,160	12	10.35	...	...	8	...	...	...	...	...	2	...	...	...	...	...	...	3	1	...	1	3	...	1	...	1	...	...	...	1	...	...	...	...
Lemon	2,371	1	.42	...	...	1	1	...	...	..	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Oxford	1 767	45	25.47	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	2	4	34	1	1	1	1	...	6	1	...	5	1	1	1
St. Clair	1,097	2	1.82	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Carroll—																																			
East	640	7	10 94	2	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	...	...	...	1	...	...	...	1	1	...
Harrison	915	10	10.93	...	...	5	2	...	...	...	...	...	...	...	...	...	...	3	...	4	...	1	1	...	...	...	...	1	...	...	...	...	...	...	...
Champaign—																																			
Jackson	1,827	7	3 83	...	...	1	...	...	...	...	...	...	...	...	...	..	...	1	...	2	1	...	4	3	1	...	...	...	...	...	...	...	...	...	...
Mad River	2,026	8	3.95	...	...	1		...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	7	4	...	...	...	...	...	...	...	...	...	...	...
Wayne	1,389	1	.72	...	...	1	...	...	1	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Clark—																																			
Bethel	2,206	5	2.27	...	...	5	3	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
German	2,058	2	.00	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...
Madison	1,163	30	25.80	...	..	7	2	...	2	...	...	...	...	...	...	...	...	1	1	2	...	2	16	1	5	...	...	...	4	...	...	6	...	5	...
Pleasant	1,3 5	5	3.77	.	.	1	...	1	..	...	...	...	...	...	...	...	...	...	...	2	...	2	2	1	...	...	...	...	...	1	...	...	...	...	1
Clermont—																																			
Jackson	1,4 8	4	2 82	2	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	1		1	3	...	...	...	2	...	...	...	...	1	...	...	...
Miami	2,179	45	20.65	3	2	7	...	1	...	...	...	...	...	...	...	...	...	2	...	13	4	9	22	1	1	...	...		9	...	...	8	2	1	...
Stonelick	1,421	5	3.25	...	.	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	3	1	...	...	...	...	...	...	...	1	...	...	...
Washington	1,713	12	7.00	4	3	5	4	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	6	...	2	...	...	2	1	...	...	...	...	...	2

Clinton—																																			
Liberty	1,103	3	2.72			3	1		1									1																	
Vernon	1,054	9	8.54			2			1									1		4		2	3					1	1	1					2
Columbiana—																																			
Butler	1,547	16	10 34		3	2		1										1		6	2	3	2						1				1		2
Hanover	1,716	15	8.74		1	2		1										1		3	1	1	10	1	1	2		1		1					1
Knox	2,034	22	10.82	1		4				1								3		5	2	1	12		3				5						1
Madison	970	7	7 22	1																			5	3					1			1	1		
Perry	1,429	12	8 40			5	2									1		1					7		2				2		1	1			
Salem	1,729	11	6 36																	1	1		10	1			1		4						
Wayne	731	3	4 10			1	1													2	2														
Coshocton—																																			
Adams	1,138	4	3 51																	1	1		3	1						1					
Jackson	1,628	16	9 81			1												1					2						2						
Keene	783	9	11 50			3	2																6						1			1			
Linton	1,599	11	6.88			4												1					4				1		1	1		1			3
Monroe	1,031	7	6.80																	2	1		5	2			1		2	1					
Tuscarawas	1,056	1	.95			1										1																			
Crawford—																																			
Chatfield	1,201	2	1.67			2	1									1																			
Dallas	430	2	4.66			2												2																	
Liberty	1,591	1	.63			1										1																			
Texas	539	4	7.42			1			1											1	1		2		1				1						
Cuyahoga—																																			
Brooklyn	1,617	15	9 28			9								3			1	3		2		1	3			1	1			1			1		
Euclid	3,780	27	7.15	3	2	1	1													5	2	1	12	1	1		1	2	2			4	3	4	2
Newburg	2,761	5	1.81			5	2							3																					
Olmstead	1,484	23	15.50	1		1												1		9		8	11	1					8				2		
Strongsville	1,023	7	6 84																	2	1	1	3								1			2	
Darke—																																			
Butler	1,679	10	5.96			3	1					1						1		1		1	6		1				1			1			
Franklin	1,731	6	3.47	1		2		1				1								2			2						2						
Greenville	3,024	20	6.62			4	1											1		5	3	1	10	2		1			4	1					1
Harrison	1,518	14	9.22			2		2												4		4	8						2	4		2			
Monroe	1,339	11	8.22			1																	9			1		1	4	1		2		1	
Richland	1,176	11	9.36			3												3		1	1		7	2				2	1			1			1
Twin	1,557	12	7.71			3									3					4		4	5						2						
Van Buren	1,504	7	4.65			5							2					3																2	2
Defiance—																																			
Adams	1,399	4	2 85	2		1		1															3				1		1						
Delaware	1,717	8	4 66			8								2				6																	
Mark	1,250	19	15.20			13								4			1	6		2	1		3					1	2					1	
Delaware—																																			
Genoa	924	6	6.50																				3	1								1	1	1	
Harlem	969	10	10.32																				4									4			
Radnor	1,152	16	13 89	2	1	2					2									1	1		13					1	1			3			
Thompson	750	4	5 33			4	3									1																			
Erie—																																			
Florence	1,145	15	13 10																	2	1	1	11											2	1
Margaretta	2,281	1	.44			1										1																			
Fairfield—																																			
Hocking	2,372	5	2.11			1											1			3		2	1									1			

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING TOWNSHIPS OF OHIO, DURING THE YEAR 1898.

864 townships.	Population (census 1890).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Fayette—																																			
Concord	735	3	4.08																				3						1			2			
Marion	864	1	1.16			1												1																	
Franklin—																																			
Brown	852	3	3.52			1												1					1						1					1	
Clinton	2,179	1	.46			1												1																	
Hamilton	1,507	16	10.62	2	2	4			2											3	1	1	9					1		1		4			1
Jefferson	1,076	6	5.60			1										1				2		2	2						1						
Truro	1,430	6	4.29			6	6																												
Washington	970	6	6.20			2												2		4		4													
Fulton—																																			
German	2,323	6	2.59			4	3											1					2		1				1						
Gorham	1,254	6	4.79	1																			6	2	1				2						
Gallia—																																			
Green	1,306	1	.77			1	1																												
Greenfield	1,371	1	.73			1			1																										
Morgan	1,415	3	2.12		1	1		1												2		2													2
Ohio	1,450	5	3.45																	1		1	4	2											
Walnut	1,765	4	2.27			4	4																												
Geauga—																																			
Auburn	735	11	15.00			1								1						3	2	1	7	2	2							3			
Chester	620	2	3.23			2	1											1																	
Claridon	785	11	14.01																																
Hampden	606	11	17.82																	6		2	4	1	1				1			1			
Huntsburgh	793	8	10.69																				8	2					5			1			
Middlefield	891	17	19.08			1			1														16	5	2				2			6			
Montville	691	1	1.45			1	1																												
Greene—																																			
Bath	1,284	6	4.69			1												1		2	2		2						1			1			
Clear Creek	1,057	4	3.78			3	2	1																										1	
Cedarville	1,006	47	46.72			2	1												1	2		1	8	2	2				2	1					11
Silver Creek	1.218	9	7.42			4			2						1								4		1			2	1					1	

Guernsey—																																			
Liberty	1,202	19	15.81			5						2	1					1		3	1	2	10	2	2				1	1				1	
Madison	1,038	15	14.45	4		3		3												6	1	5	3		1										3
Westland	819	8	9.77			1	1													2	1		5		1	1			2						
Wills	1,081	11	10.18			2												2		2	1	1	7	2	1		1		1						2
Hamilton—																																			
Anderson	3,483	10	2.87			1			1											4	1	2	5	1				1	1			2			
Colerain	3,318	7	2.09	1	1	2												2		2		2	3									3			
Green	4,038	31	7.68																	1		1	16	1	1		4		6	2		2			
Mill Creek	8,975	34	3.79	1		1			1														18	1	1	2	1	1	6	1		4			1
Spencer	268	1	3.74																				1					1							
Sycamore	5,466	34	6.22	3		4			1			1						1		2	1	1	17	1			1			1	1			2	5
Whitewater	1,317	10	7.60			2	2													1	1		1									1	6		
Hancock—																																			
Amanda	898	4	4.45																				4	1			1					1			
Biglick	1,222	4	3.27	2	1																													1	
Madison	943	24	25.45	6		10												10		1	1		7	1											
Van Buren	957	3	3.14			1			1														2	1								1			
Hardin—																																			
Cessna	873	1	1.15			1											1																		
Liberty	1,424	11	7.72			1																													
Lynn	1,105	7	6.33			3	1											2		2	1	1	1									1			
Marion	1,281	8	6.25			2										1							5		1									1	5
Washington	1,312	4	3.06	1		1		1												2		2	1						1						
Harrison—																																			
Monroe	1,882	15	7.97	4																1		1	11	2					1			6	1	2	
Moorefield	1,150	10	8.69	1		1		1												3	1	1	2									2	4		
Henry—																																			
Harrison	1,349	5	3.71			5											1		4																3
Liberty	1,380	6	4.35																	3	1	2	3						1						
Marion	1,567	4	2.55			3											1		2				1						1						
Richfield	1,448	5	3.45	2		2			2											1			2						2						
Ridgeville	1,249	13	10.41		1	3		1	1									1		1		1	4	1				1							4
Highland—																																			
Hamer	938	5	5.33																	2			2	1					1					1	
New Market	,266	9	7.11																	3		3	6					2		2		2			
Penn	1,029	3	2.92			1												1					2		1				1						
Washington	892	6	6.73			2										1				1		1	3									3			1
Hocking—																																			
Washington	989	6	6.07			3											1		2		3														
Holmes—																																			
Knox	989	7	7.08			7	1	3										3																	
Prairie	1,424	2	1.41																	2		2													
Richland	1,433	8	5.58			2										1			1				6				1		3			2			1
Huron—																																			
Clarksfield	1,143	15	13.12	1		1					1									5	1	4	9	4					3			1			
Fairfield	1,138	22	19.33	1		7	1									4	2			2	1		13	1					5						
New Haven	792	5	6.32																																
Townsend	1,232	5	4.06			2	2																										1		2
Wakeman	1,189	12	10.10		1	2			1									1					8	2	1				3		1	1		1	
Jackson—																																			
Franklin	1,091	1	.92			1	1																												
Jackson	1,847	9	4.87			9	5											4																	

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Jefferson—																																			
Brush Creek	539	9	16.70	2	1	2	2	...	...	...	...	...	...	...	...	...	...	...	...	4	1	...	1	1	...	...	...		...	...	...	...	...	1	...
Springfield	922	8	8.68	...	...	4	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...	...	...	1	...	...	...	...	...	...
Knox—																																			
Butler	775	3	8.90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	1	...	...	...	...	...	...
Jackson	841	8	9.51	...		3	...	...	...	...	...	1	...	2	...	...	...	...	...	5	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...
Milford	792	29	36 62	...	...	2	...	1	...	...	...	...	...	...	1	...	...	...	...	9	2	7	18	1	3	1	2	3	2	1	...	5	...	...	13
Monroe	874	3	3.42	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Wayne	675	1	1.48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Lake—																																			
Kirtland	909	3	3.30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Painesville	1,632	10	6.13	...	...	3	...	...	1	...	...	...	1	...	...	...	...	...	...	4	...	2	2	...	...	...	...	...	1	...	...	1	...	1	...
Perry	1,865	17	12 04	1	...	2	1	...	...	1	...	...	...	...	...	...	...	...	...	7	4	...	7	1	...	...	...	...	1	...	...	...	...	1	...
Willoughby	1,671	17	10.17	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	7	...	1	...	...	...	4	...	...	2	...	...	...
Lawrence—																																			
Elizabeth	3,369	9	2.67	2	3	3	2	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	4	...	1	...	...	...	2	...	1	...	...	1	2
Perry	2,039	6	2.95	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Washington	874	4	4 58	...	2	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Licking—																																			
Liberty	702	8	11.39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	7	3	...	...	...	...	1	...	...	1	...	...	...
Lima	1,193	3	2 52	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	1	2
McKean	866	6	6.93	...	...	3	...	2	...	...	...	...	...	...	...	...	...	1	...	1	...	...	1	1	...	...	...	...	...	...	...	...	...	...	1
Mary Ann	882	3	3.42	...	...	3	...	2	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perry	1,007	3	3.00	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	...	...	...	1	...	1	...	...	...	...	...	...
Logan—																																			
Jefferson	1,141	6	5.26	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	5	...	...	2
Liberty	1,563	1	.64	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
McArthur	1,009	9	9.00	...	...	2	...	...	1	...	...	...	...	...	1	...	...	...	...	4	1	3	3	2	...	...	...	...	1	...	...	...	...	...	...
Perry	1,109	3	2.71	...	...	3	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stokes	1,552	3	1.91	...	...	3	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Zane	606	7	11.55	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	6	...	1	...	1	1	...	...	...	...	...	...	...

Lorain—																																			
Black River	456	1	2.19																				1						1						
Brighton	538	2	3.72																				2		1							1			
Eaton	1,139	11	9.66			8	1	4					3							1			2						2						2
Grafton	841	3	3.55																	2		2	1												
Pittsfield	893	6	6.72																				2		1		1								
Lucas—																																			
Jerusalem	500	9	18.00			1																	8				5				1	1			
Oregon	2,660	93	34.96	23	13	15	2	8	4									1		10	2	7	25	2	2	2	5	3	7	2		2		5	24
Sylvania	931	13	13.96			3					1							1		1	1		8	2	1	1			2					1	1
Washington	2,462	34	13.81	5	8	4	2	2												4		2	23	2		2			5	1		3		1	2
Madison—																																			
Pike	602	5	8.32			2	1											1					2				1		1						
Mahoning—																																			
Austintown	1,668	6	3.60			1												1		1		1	4									1			
Boardman	961	4	4.16																	2	1														
Canfield	890	11	12.36			1				1										3	2		6			2		2				1		1	
Ellsworth	656	1	1.53																				1									1			
Green	1,893	7	3.70			1	1																4		2		1		1						2
Goshen	1,308	2	1.61			1								1						1															
Smith	1,913	12	6.27		1	6			1		1		1			3							6						1	1		1			
Springfield	2,397	11	4.60	1	1	3		2			1												8	2	1		1		3			1			
Marion—																																			
Big Island	1,471	1	.68			1		1																											
Bowling Green	1,058	1	.94			1	1																												
Grand	514	3	5.83	1		1		1															2		1				1						
Medina—																																			
Lafayette	1,150	3	2.60																				3		1				1						
Litchfield	807	11	13.63			3												3		1	1		6	1	1			2	2					1	3
Medina	686	11	16.03			11								5		4		2																	
York	889	7	7.87			1								1						2	1		4						2			1			
Meigs—																																			
Chester	1,604	21	13.09	2																1	1		14	2					4	1		7			3
Mercer—																																			
Franklin	1,240	6	4.84		1															2		2	3				1					1		1	2
Granville	2,013	14	6.96	1	2	7	7													4	3	4	3	1											
Hopewell	1,414	1	.71			1	1																												
Miami—																																			
Bethel	1,685	1	.60			1																													
Newberry	2,276	13	5.71	2		2		1										1		5		2	4	1				1	1						
Spring Creek	1,421	17	11.93	1		2		1										1		8	1	4	4	1	1				1			1	3		
Union	3,362	4	1.19			2		1										1					2									1			
Washington	1,037	24	23.14																				16	1	2	2			4	1		3	6	2	
Monroe—																																			
Benton	921	10	10.86			2		2												2		2	6				1		2	1					1
Summit	862	1	1.16																	1		1													
Montgomery—																																			
Butler	1,623	10	6.16			1					1									4		1	5					2	1	1					1
Randolph	2,096	14	6.68			5	2		3											2		1	6			1			1			1	1		
Wayne	1,057	1	.95																				1												
Morgan—																																			
Marion	1,807	3	1.66			1	1																2	1	1										
York	939	12	12.78			1														6		6	4						2				1		

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING TOWNSHIPS OF OHIO, DURING THE YEAR 1898.

864 townships.	Population (census 1890).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Morrow—																																			
Canaan	1,128	6	5.32																	2		1	3	1										1	
Lincoln	995	7	7.04	1		1												1																	
North Bloomfield	1,105	4	3.62																	1		1	3	1	1							1			
Westfield	1,036	1	.96																				1									1			
Muskingum—																																			
Blue Rock	1,070	15	14.02	2	2	4		1			1							1	1																8
Clay	307	3	9.77																	3		2													
Falls	1,591	19	12.01			1												1					14	3	2							4	4		
Jackson	869	15	17.03			12	1	1										9		3	1	2													
Licking	872	3	3.41																	3		1													
Newton	2,131	26	12.20			12						6						4		6	1	5	7	1	2			1				3		1	8
Salt Creek	1,148	12	10.46			9								4				2	3				3									2			
Noble—																																			
Buffalo	813	4	4 92																				4		1										
Olive	1,356	2	1.48			2	2																												
Ottawa—																																			
Bay	548	2	3 65																	1	1		1									1			
Benton	3 010	15	4.98																																
Catawba	550	4	7.27			4	1																												
Erie	553	4	7.27			2		1			1												2					1		1					
Put-in-bay	769	3	3 90			1														1			1									1			
Salem	1,373	2	1 46			2												2																	
Paulding—																																			
Carryall	1,307	25	19.13			14	2	8					2		5			4		6	1	5	5						2			3			
Crane	1,069	6	5.61			6	4											1																	
Jackson	2,266	22	9 71	1	2	6	2						1					3		5	1	4	4		1			1				2	1		3
Latty	2,010	9	4.48			7	4											3		2		2													
Perry—																																			
Clayton	1,721	3	1.74			2										1		1																1	
Harrison	1,771	6	3.39			5	1	1	1														1	1											
Hopewell	1,238	1	81			1	1																												
Monday Creek	1,090	12	11.00																	4	1	3	7						4			1		1	1
Saltlick	1,416	11	7.77			8		1					2							3	1	2	5				2		1			2			

Pickaway—																																			
Darby	1,459	3	2.06																																
Deercreek	1,167	16	13.71			2					1			1						3	1	2	10		2			1	3			2		1	
Harrison	916	2	2 18			2	2																												
Madison	828	6	7.25			4			3											1		1	1					1							1
Perry	1,160	5	4.31																	5		3													1
Scioto	2,003	3	1.49			1		1															2		1				1						
Walnut	1,546	2	1.30			2	2																												
Pike—																																			
Jackson	1,962	22	11.21			3	1											2		6		6	10		1				3					3	
Marion	840	1	1.20			1	1																												
Pee Pee	1,021	1	98																	1		1													
Seal	537	11	20.49		1	1	1													3		2	6			2			3			1			
Union	722	3	4 16			2	2																1						1						
Portage—																																			
Atwater	1,100	17	15 45			4			3											2	1	1	11	2					5	1		8			
Aurora	619	2	3 23																				2		1							1			1
Deerfield	915	8	8.74			1														1		1	3	2					1					8	7
Hiram	1,130	2	1.75																				1									1	1		
Paris	669	1	1.50			1																													
Ravenna	1,004	26	25 89			2		1										1		7	2	4	15	2	1			2	7			2		2	1
Shalersville	958	6	6 26		3															1		1	5						1			1			
Streetsboro	707	5	7.07	1																1		1												4	1
Preble—																																			
Gasper	729	8	10.98																				4		1				2				4		
Jasper	1,213	4	3 30			2																	2		2										2
Monroe	1,702	15	8.81			5		1	2			1								3		3	5	1					2			1	2		
Twin	1,508	1	.66	1																			1						1						
Richland—																																			
Blooming Grove	1,022	4	3.91	1		2		1										1					2	1								1			
Cass	845	20	23.67		2	3	3																1						1						
Plymouth	796	3	3 77																				3	1					2						
Springfield	1,266	1	.73			1										1																			
Weller	922	6	6.50	1		1		1															3	1		1			1				1		1
Ross—																																			
Buckskin	1,806	3	1.66			2		2																										1	3
Concord	2,240	42	18 75	4		5		1	2					1						16	3	9	16	3			1		4	1		3		1	
Jefferson	959	5	5.22			3	2											1					2						1			1			
Liberty	1,651	26	15.72			11	9											2		7	1	3	6		1	1			1			3		2	4
Springfield	1,175	1	85			1	1																												
Union	2,505	7	2.79			1												1		3	1	1	4		1				3						
Sandusky—																																			
Jackson	1,509	5	3.31			2												2		1	1		2		1				1						
Scioto—																																			
Green	1,751	8	4.57			2	1							1						2		2	4									4			
Jefferson	1,008	4	3 97			2	1													2		2													
Morgan	934	3	3.21																				2					1	1				1		3
Washington	1,223	19	15.54			10	5		1								1	2		1		1	1			1								6	
Seneca—																																			
Bloom	1,248	9	7.21	1		1									1					1		1	5						1	1	1	2		1	
Thompson	1,634	10	6.12	1		1		1												1		1	6	1	1				1					1	1

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING TOWNSHIPS OF OHIO, DURING THE YEAR 1898.

384 townships.	Population (census 1890).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsilitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexy.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births
Shelby—																																			
Orange	1,012	4	3.90																	1		1	3	1											
Perry	1,134	7	6.17			1																	4	2					1			1		2	
Washington	761	1	1.32																															1	
Stark—																																			
Canton	2,288	8	3.50			3	2											1					1	1									4		
Lake	2,164	22	10.66			2		1										1		4		4	5		3				1			1			
Lawrence	2,126	18	8.47	6	5	3		1										2		4	1	1	9			1			4			1	1	1	1
Lexington	1,215	8	6.59			2						2								3		1	2						2					1	
Marlboro	1,537	13	8.46			1												1		1	1		7	2	1			1	3					3	
Nimishillen	1,736	24	13.82			4		1	1						1			1		6	3	3	5	2					1	2					
Osnaburg	2,287	26	11.37	2	1	16							5					1		3		3	6		1				4			1			1
Perry	2,197	14	6.37			2												2		1	1		3												
Plain	2,619	3	1.15		1	2	1											1					1						1						
Sandy	661	3	4.54																				3			1			1						
Tuscarawas	3,350	29	8.66	4	8	7	1	1				1			1	1		1	1	4		4	15	2							4			3	1
Washington	1.809	14	7.74	2																1	1														2
Summit—																																			
Boston	711	8	11.25	4	1																		3				1		1			1			
Copley	839	11	13.11	2	1	4		1				1						2					4	1			1					1			
Coventry	2,309	2	87																																
Franklin	1,959	18	9.14																				2						2					1	1
Green	1,911	1	52			1	1																												
Hudson	654	10	15.30		1	2								1		1				1	1		5						1				1	1	
North Hampton	896	3	3.35			2														1	1														
Northfield	940	13	13.83	1																3		3	8						2			1			1
Portage	2,659	13	4.89	2		2	1						1										8		3			1	1			1		1	
Springfield	1,966	12	6.10			5				1								4		3		3	4						3			1			

Trumbull—																																			
Bazetta	601	9	14.97	2		3			1		1								1	1		1	2									1		1	2
Braceville	972	9	9.26		1	1		1												1	1		5	2				1				2	2		2
Bristol	1,184	14	11.82	1		3	1											1		8	7	1	3						3						
Brookfield	1,713	4	2.34																	3	2	1												1	
Fowler	904	4	4.42																				2		1				1						
Lordstown	720	7	9.72																	2		2	2						1				2		
Vienna	1,298	6	4.62			1																	5		1										
Weathersfield	1,470	1	.68			1	1																												
Tuscarawas—																																			
Franklin	1,127	17	15.08	10	2	8		3		1					2			1					9	1					1			7			8
Sandy	1,251	11	8.79			5		3										2		1	1		3	2			1						1	1	
Warwick	1,057	5	4.73	2	1	1		1															4		1		2								4
Union—																																			
Claibourne	1,488	18	12.10			7	1	2								3				4	1	3	2		1				1				5		2
Darby	945	7	7.41			2						1											4	1	2				1					1	
Dover	1,000	4	4.00																	3		3	1		1										
Jerome	1,249	3	2.40			1									1								1						1						1
Van Wert—																																			
Jackson	1,340	11	8.21	4		4		2				1			1					1		1	3	1	1		1								3
Jennings	1,374	1	.73																	1	1														
Pleasant	1,382	1	.70			1	1																												
Tully	1,699	2	1.12			2	2																												
Vinton—																																			
Knox	1,059	9	8.50			5	5													1		1	2			1			1						
Warren—																																			
Clear Creek	1,914	16	8.36	1		3								1						1		1	10	3	4				1	2			2		1
Hamilton	1,711	33	19.22	2	1	4		2										1	1	6		6	9		1		2		3			3	6	2	3
Harlem	1,729	7	4.05																				7					1				2			
Washington—																																			
Aurelius	861	10	11.62			1												1		2	1	1	4										2	1	2
Belpre	1,001	25	24.97	1		3	2	1												3	1	2	5		1				4						
Fairfield	725	7	9.66			3	3													2	1	1	2		1				1						
Ludlow	1,218	15	12.31			3			1					1				1					3	1					1				3	6	
Newport	2,405	21	7.47			11	5	1										5		3		3	7		1	1			3			2			2
Wayne—																																			
Chippewa	1,882	8	4.25			5	1																3				2					1			
East Union	2,579	15	9.50			3		2							1								12		1		1		5			5			12
Franklin	1,323	9	6.80																				9		2				3			1			
Wayne	1,755	6	3.42																	3		1	3	1				1				1			
Williams—																																			
Madison	1,272	8	6.30			7	6											1		1		1													
Wood—																																			
Freedom	1,102	7	6.35			4			1									2					3						3						4
Lake	1,585	4	2.53			1													1				2						1					1	2
Milton	1,624	19	11.70			2												2		3		2	9		2		1	2	1				5		1
Perrysburg	2,374	1	.42			1	1																												
Webster	1,420	6	4.23			6												6																	
Weston	713	20	28.05	1		2			1									1		3		3	8	1	2			1	3			1	4	1	1

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN THE FOLLOWING TOWNSHIPS OF OHIO, DURING THE YEAR 1898.

364 townships.	Population (census 1890).	Total deaths, all causes.	Annual rate per 1,000.	Total under one year.	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever	Scarlet fever.	Tonsillitis.	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases.	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Wyandot—																																			
Antrim	1,115	4	3.60	1	.....	2	.....	.....	...	...	...	...	...	...	...	2	...	.....	...	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Eden	1,392	8	2.16	....	.....	1	1	.....	...	...	...	...	...	...	...	...	...	....	...	1	.....	1	1	....	..	.....	....	.....	1	.....	...	....	....	.....	.....
Total	499,285	3,873	6.76	167	8 7	801	192	98	49	5	21	24	20	36	27	37	4	203	15	548	125	316	1,377	149	125	30	57	56	343	41	12	231	106	116	237

ABSTRACT OF THE REPORTS OF DEATHS, AND THEIR CAUSES, IN OHIO, DURING THE YEAR 1898.

	Population (estimated.)	Total deaths, all causes.	Annual rate per 1,000	Total under one year	Total under five years and over one year.	Total zymotic diseases.	Croup and diphtheria.	Cholera infantum.	Cerebro-spinal meningitis.	Cholera morbus.	Diarrhœal diseases.	Dysentery.	Malarial fever.	Measles.	Puerperal fever.	Scarlet fever.	Tonsillitis.
Cities over 10,000 (1890)	1,510,695	18,385	12.84	3,706	1,750	2,746	387	489	126	32	99	93	57	53	24	65	7
Cities under 10,000 (1890)	251,945	2,824	11.21	292	165	470	43	72	43	5	28	19	16	12	7	2	6
Villages (266)	443,201	4,764	10.75	440	210	980	125	223	68	11	37	54	21	38	31	26	9
Townships (364)	499,285	3,373	6.76	167	87	801	192	98	49	5	21	24	20	36	27	37	4
Totals	2,705,126	29,346	10.85	4,605	2,212	4,997	747	882	286	53	185	190	114	139	92	130	26

	Typhoid fever.	Whooping cough.	Total constitutional diseases.	Cancer.	Phthisis pulmonalis.	Total local diseases	Apoplexia.	Bright's disease.	Bronchitis.	Convulsions.	Gastritis and peritonitis.	Heart disease.	Meningitis.	Pleurisy.	Pneumonia.	Total developmental diseases.	Total violence.	Premature and still-births.
Cities over 10,000 (1890).	456	136	3,280	611	1,948	8,990	532	122	583	700	496	1,255	611	40	1,603	1,949	1,071	1,714
Cities under 10,000 (1890)	84	16	664	106	398	1,3 8	135	88	52	56	93	275	74	8	186	164	136	130
Villages (266)	180	22	979	202	570	1,901	175	156	49	96	120	468	103	8	278	226	256	322
Townships (364)	203	15	548	125	316	1,377	149	125	30	57	56	343	41	12	231	106	116	237
Totals	923	189	5,471	1,044	3,232	13,576	991	791	714	909	765	2.341	829	63	2,298	2,445	1,579	2,403

SUMMARY OF MORTALITY REPORTS.

The total number of deaths reported from all causes—excluding premature and still-births—by the cities, villages and townships represented in the foregoing tables was 29,346 The average estimated population of the cities, villages and townships represented was 2,705,126, which is equal to an annual death rate of 10.85 per thousand living population represented.

The deaths in 2,141,781 living population (estimated) in 1897 were 26,215, equal to an annual death rate of 12.24 per thousand; while in 1896 the total number of deaths reported in 1,753,992 population (estimated) was 23,794, equal to a mortality rate of 13.57 per thousand.

DEATHS OF CHILDREN UNDER FIVE YEARS OF AGE.

The number of deaths reported of children under five years or age (premature and still-born excluded), was 6,817, which is equal to 23 per cent. of the deaths from all causes, and a death rate of 2.52 per thousand population represented. The death rate of children under five the preceding year was 3.32 per thousand population represented.

ZYMOTIC DISEASES.

The total number of deaths reported from zymotic diseases was 4,997, which is equal to 17 per cent. of the deaths reported from all causes, and an annual rate of 1.85 per thousand of the population represented.

The number of deaths reported the preceding year from zymotic diseases was 4,486 , equal to a death rate of 2.1 per thousand population represented.

CROUP AND DIPHTHERIA.

The total number of deaths reported from croup and diphtheria was 747, which is equal to 2.6 per cent. of the deaths reported from all causes, and a death rate of .3 per thousand of the population represented.

The number of deaths reported the preceding year from these causes was 778, equal to a mortality rate of .3 per thousand of the population represented.

CHOLERA INFANTUM, CHOLERA MORBUS AND DIARRHŒA.

The total number of deaths reported from cholera infantum, cholera morbus and diarrhœa was 1,120, which is equal to 3.9 per cent. of the deaths reported from all causes, and a mortality rate of .4 per thousand population represented.

The number of deaths reported the preceding year from these causes was 1,064, which is equal to a mortality rate of .5 per thousand of the population represented.

MEASLES, SCARLET FEVER AND WHOOPING COUGH.

The total number of deaths reported from measles, scarlet fever and whooping cough was 458, which is equal to 1.6 per cent. of the total number of deaths reported from all causes, and a mortality rate of .17 per thousand of the population represented.

The total number of deaths reported from these diseases during the preceding year was 333, equal to a mortality rate of .15 per thousand population represented.

TYPHOID FEVER.

The total number of deaths reported from typhoid fever was 923 which is equal to 3.1 per cent. of the total number reported from all causes, and a mortality rate of .34 per thousand population represented.

The number of deaths reported from this cause the preceding year was 661, equal to a mortality rate of .39 per thousand living population, represented.

CONSTITUTIONAL DISEASES.

The total number of deaths reported from constitutional diseases was 5,471, which is equal to 18 per cent. of the deaths reported from all causes, and a mortality rate of 1.9 per thousand population represented.

The number of deaths reported from constitutional diseases the preceding year was 5,222, equal to a mortality rate of 2.4 per thousand population represented.

CANCER.

The total number of deaths reported from cancer was 1,044, which is equal to 3.5 per cent. of the deaths reported from all causes, and a mortality rate of .39 per thousand population represented.

The number of deaths reported from this cause the preceding year was 927, equal to a mortality rate of .43 per thousand population represented.

CONSUMPTION.

The total number of deaths reported from consumption was 3,232, which is equal to 11.01 per cent. of the deaths reported from all causes, and a mortality rate of 1.19 per thousand population represented.

The number of deaths reported from this cause the preceding year was 2,972, equal to a mortality rate of 1.40 per thousand population represented.

LOCAL DISEASES.

The total number of deaths reported from all local diseases was 13,576, which is equal to 46.3 per cent. of the deaths reported from all causes, and a mortality rate of 5. per thousand population represented.

The number of deaths reported from all local diseases the preceding year was 11,365, equal to a mortality rate of 5.3 per thousand population represented.

BRONCHITIS, PLEURISY AND PNEUMONIA.

The total number of deaths reported from bronchitis, pleurisy and pneumonia was 3,075, which is equal to 10.05 per cent. of the deaths reported from all causes, and a mortality rate of 1.1 per thousand of the population represented.

In the preceding year there were 2,643 deaths reported from these causes, equal to a mortality rate of 1.24 per thousand population represented.

CONVULSIONS AND MENINGITIS.

The total number of deaths reported from convulsions and meningitis was 1,738, which is equal to 5.9 per cent. of the deaths reported from all causes, and a mortality rate of .64 per thousand population represented.

The number of deaths reported from these diseases the preceding year was 1 702. equal to a mortality rate of .79 per thousand population represented.

DEVELOPMENTAL DISEASES.

The total number of deaths from developmental diseases reported (excluding premature and still-births) was 2,445, which is equal to 8.3 per cent. of the deaths reported from all causes, and a mortality rate of .9 per thousand population represented.

During the preceding year there were 3,141 deaths reported from developmental diseases, equal to a mortality rate of 1.5 per thousand population represented.

VIOLENCE.

The total number of deaths reported from violence was 1,579, which is equal to 5.4 per cent. of the deaths reported from all causes, and a mortality rate of .58 per thousand population represented.

During the preceding year there were 1,503 deaths reported from violence, equal to a mortality rate of .7 per thousand population represented.

PREMATURE AND STILL-BIRTHS.

The total number of premature and still-births reported was 2,403, which is equal to 8.2 per cent. of the deaths reported from all causes, and a rate of .89 per thousand population represented.

During the preceding year there were 2,221 premature and still-births reported, equal to a rate of 1.04 per thousand population represented.

APPENDIX I.

Second Report

OF AN

Investigation of the Rivers of Ohio

As Sources of Public Water Supplies.

BY THE OHIO STATE BOARD OF HEALTH.

1899.

SECOND REPORT UPON THE EXAMINATION OF SOURCES OF WATER SUPPLIES.

The Board has recently published in separate form a preliminary report upon the "Examination of Sources of Water Supplies," to which attention was called in the last report. The investigation last year was confined to the Scioto, Olentangy and Mahoning rivers. During the present year the Board has had under observation the Maumee and Sandusky rivers and their branches. Stations for observation were established as follows: On the Maumee river, Findlay, Lima, Ft. Wayne, Indiana, Defiance, Napoleon and Toledo. On the Sandusky river: Crestline, Bucyrus, Upper Sandusky, Tiffin, Fremont and Sandusky. Chemical and bacteriological examinations have been made monthly, commencing in June, of these streams above and below the stations named above. Arrangements have been made for the daily measurement of these streams, with the coöperation of the Division of Hydrography of the United States Geological Survey. Daily measurements are also being made of the Scioto and Olentangy rivers. The stations are located as follows: On the Sandusky, at Mexico and Fremont; on the Maumee, at Waterville; on the Olentangy, the Fifth avenue bridge, Columbus; and on the Scioto, the Grandview bridge, Columbus.

Accurate determinations of the daily volume of flow of our Ohio streams will afford information of much value, affecting sanitary as well as other interests. These observations are to be continued for several years, and, with others, will afford a basis in connection with rainfalls to compute the flowage of all our streams.

Further on will be found a detailed report of the results of the chemical and bacteriological examinations, and of the various sources of pollution upon the two watersheds under examination, with other matters of interest bearing upon the condition of the two streams—the Sandusky and Maumee rivers.

SUMMARY.

SANDUSKY RIVER.

The results of examinations of samples of river water, and the report of the engineer of his inspection of the watershed, show there is a serious pollution of this river at many points along its course. Beginning at Crestline we find one of the upper branches of the river badly polluted by the sewage of that city. Complaint is already made of the nuisance thus created, and the near future will doubtless witness demands upon Crestline to care for its sewage in a proper manner.

At Bucyrus we find an exceedingly bad state of affairs. The river in the village, and for some distance below, during dry weather is a foul, stinking stream; an unbearable nuisance, outraging many people compelled to live within its disease-breeding influence. The State Board of Health has refused to allow Bucyrus to construct additional sewers to discharge into the river, but the city should be compelled, and without delay, to remedy this evil by the construction of sewage purification works.

The public water supply of Bucyrus is badly polluted, and fortunately is held in such low esteem as to be but little, if at all, used for domestic purposes. The filters in use afford no adequate purification of the supply.

At Upper Sandusky the river, which has not recovered from its gross pollution at Bucyrus, is again used to receive sewage. While the conditions here are not nearly so bad as at Bucyrus, any increase in the amount of sewage of Upper Sandusky will create a serious nuisance.

The water supply of Upper Sandusky is in part derived from the river, 24 miles below Bucyrus, the point of maximum pollution. That this is a safe supply no one would maintain. The city should at once begin a systematic search for additional ground water, and failing to find it, should make provision for proper purification of all river water used.

Tiffin, the largest city directly upon the Sandusky river, is thickly built up along both banks of the river. Sewage is discharged into the river at various points within city limits. A low dam just below the city maintains, most of the time, a shallow depth of water over the river bed, which is quite wide at this point. The pollution of the river has been the cause of much complaint, though this has been less for the last two years, greater attention during this time having been paid to keeping a fair depth of water over the river bed. The time cannot be far distant when Tiffin will be forced into giving attention to the question of sewage purification.

The water supply of Tiffin is taken in part from the river. While there are no nearby sources of pollution of the river at this point, the examinations show that it is far from a desirable supply. The Water Works Company's claim that they can, by changing their pumping arrangements, furnish an adequate quantity from their deep wells, should be put to the test at once.

Fremont looks to the Sandusky river for a part of its water supply. Being but 23 miles below Tiffin, a city of 14,000 people, and discharging all its sewage into this river, the supply cannot be regarded as a safe one. Evidence of this sewage pollution is clearly given by the chemical and bacteriological examinations of the river water at this point. Fremont should persevere in her attempt to obtain the entire water supply from deep wells.

The conditions threatening the water supply of Sandusky deserve serious consideration. This city, of over 20,000 people, is built along Sandusky bay. The bay receives whatever filth remains in the Sandusky river, poured into it by the cities along its course, as noted above. In addition it receives all of the sewage of Sandusky. The bay is shallow, and at the water works crib, 1,200 feet from the shore line, is only seven feet deep. The lake currents, when the wind blows from a certain point, carry sewage polluted water to the intake. The supply can scarcely escape pollution at times. Sandusky should go to Lake Erie, beyond sources of pollution, for a new water supply, or should adequately purify the present supply.

MAUMEE RIVER.

The Maumee river is less seriously polluted than the Sandusky, although some of its tributaries have become very foul in dry weather.

Perhaps the worst place to be found is at Findlay. This is a city of about 20,000 persons, located on the Blanchard river. One of the main sewers discharges into the river near the central part of the city, and in summer produces a pollution of the river which has already caused suits to be brought for damages. A part of the sewage goes into Eagle creek, which is also badly polluted. The conditions at Findlay demand early attention. The river flow is much too small to receive the sewage of the city, and sewage disposal works should be constructed without delay.

The water supply of Findlay is taken from the Blanchard river, with some attempt at purification. The supply is not of very good quality, and better methods of purification are necessary.

Lima, on the Ottawa river, is another example of attempting to utilize a small stream to dispose of the sewage of many people. The conditions here have been somewhat improved by cutting a channel or open ditch in the stony bottom of the river, which confines the sewage, in low water, and carries it away from the city before decomposition has progressed very far. The river, however, is in bad condition, and sewage disposal works will eventually be required.

Napoleon, on the Maumee river, discharges its sewage into that stream. So far no nuisance has been caused thereby. The uppermost sewer, however, discharges into the river not far below where water is taken from the river for water works purposes. A dam in the river gives almost slack water at this point, and during up-river winds the sewage is driven above the water works intake. Napoleon's water supply is further menaced by the sewage of Defiance, a city of 9,505 inhabitants, seventeen miles above.

Toledo, a city of about 120,000 inhabitants, at the mouth of the Maumee river, discharges its sewage into the river and into Swan creek. Complaint has already been made of the pollution of this creek. The city obtains its water supply from the river. The Children's Home, and several club houses and summer resorts, not more than five or six miles above the water works intake, discharge their sewage into the river, endangering, to some degree, the city's water supply. A few miles above these sources of contamination are the growing towns of Maumee and Perrysburg. Both places are discussing the question of sewerage, with no other practical outlet except the Maumee river.

To briefly sum up the results of the year's investigation, they show conclusively that both the Sandusky and Maumee rivers are already polluted at many places beyond the limit of safety, and that in no place do their waters afford a perfectly safe domestic supply.

Following are the reports of the chemist, bacteriologist and engineer:

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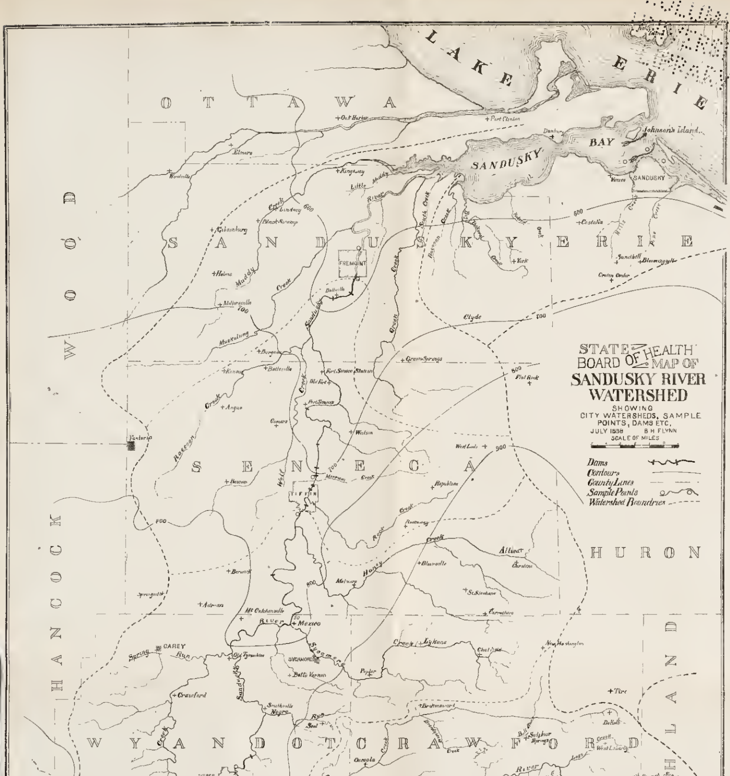
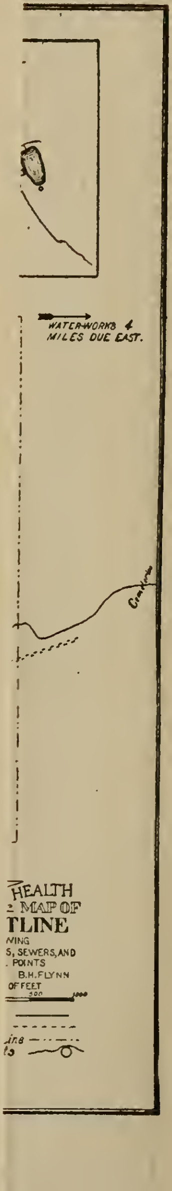


STATE BOARD OF HEALTH MAP OF
SANDUSKY RIVER WATERSHED
SHOWING
CITY WATERSHEDS, SAMPLE POINTS, DAMS ETC,
JULY 1898 B H FLYNN


WATER-WORKS 4
MILES DUE EAST.
HEALTH
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. POINTS
B.H. FLYNN
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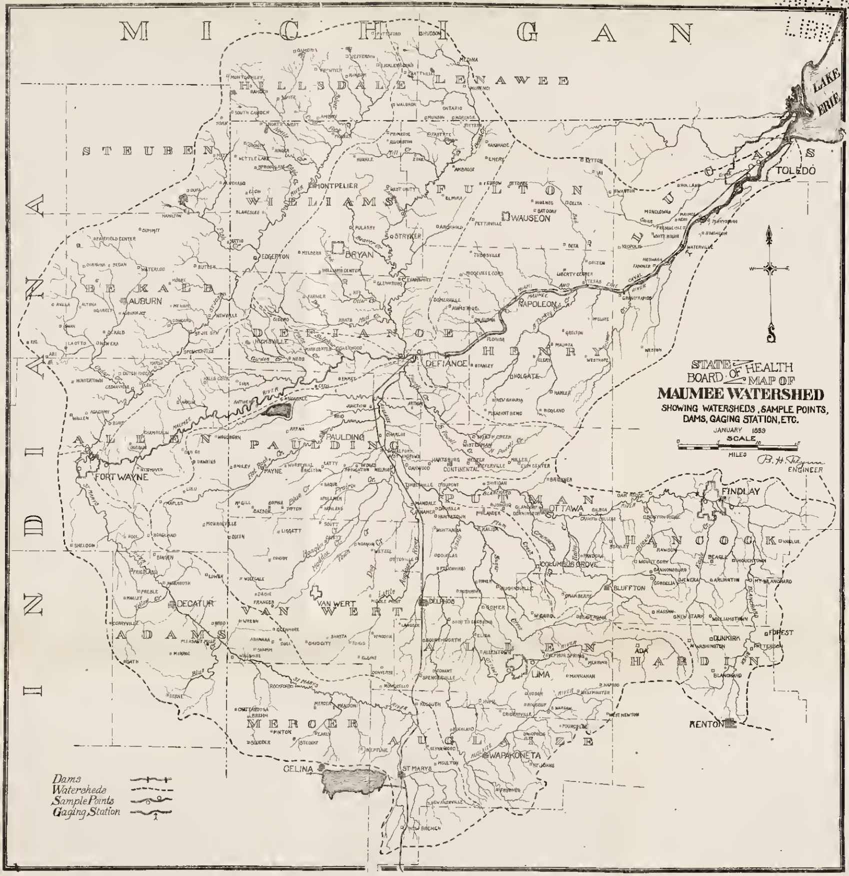

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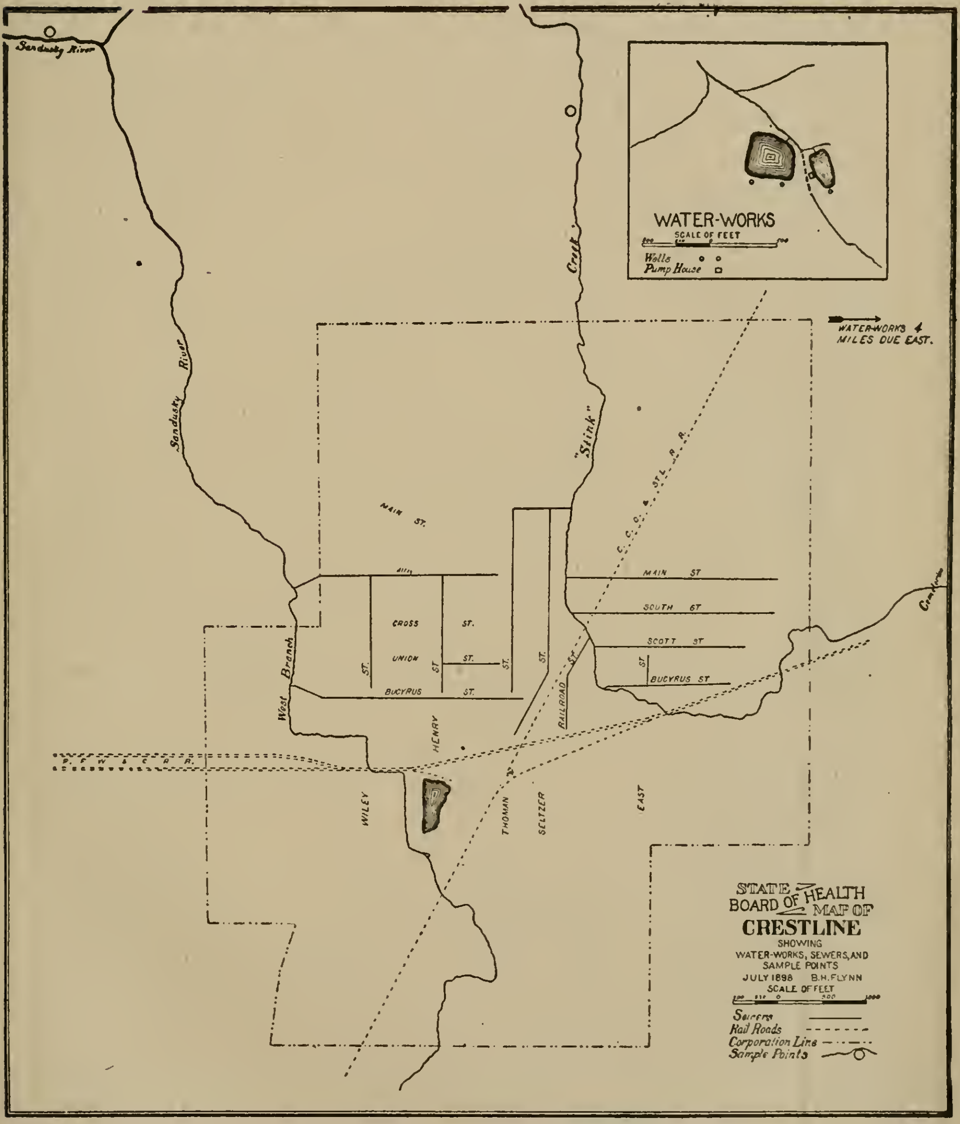
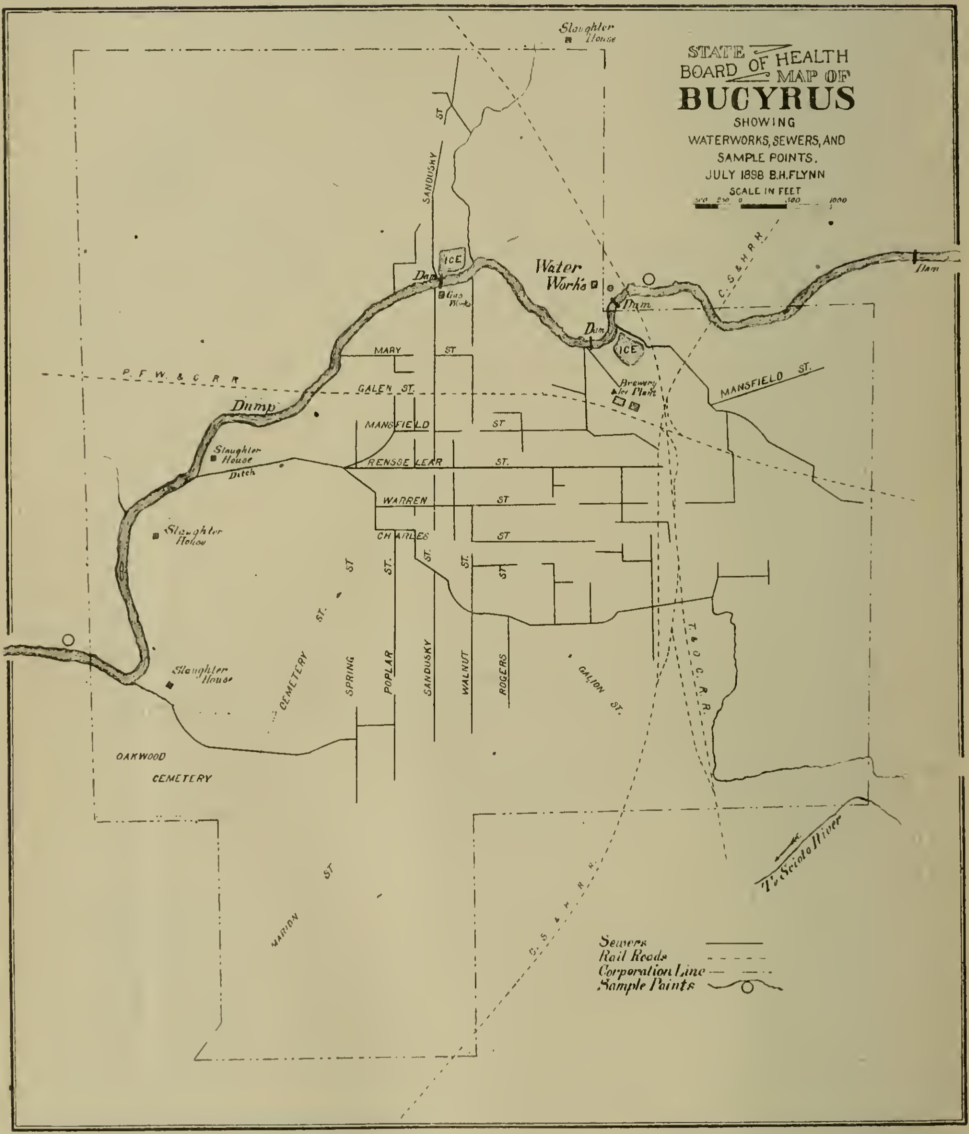

Sandusky River
Sandusky River
"Stink" Creek
West Branch
WATER-WORKS
SCALE OF FEET
Wells
Pump House
WATER-WORKS 4 MILES DUE EAST.
C. C. C. & ST. L. R. R.
P. F. W. & C. R. R.
MAIN ST.
MAIN ST.
SOUTH ST
SCOTT ST
BUCYRUS ST
CROSS ST.
UNION ST.
BUCYRUS ST.
ST.
ST.
ST.
ST.
HENRY
WILEY
THOMAN
SELTZER
EAST
RAILROAD ST.
STATE BOARD OF HEALTH MAP OF
CRESTLINE
SHOWING
WATER-WORKS, SEWERS, AND SAMPLE POINTS
JULY 1898 B.H. FLYNN
SCALE OF FEET
Sewers
Rail Roads
Corporation Line
Sample Points


STATE BOARD OF HEALTH MAP OF
BUCYRUS
SHOWING
WATERWORKS, SEWERS, AND
SAMPLE POINTS.
JULY 1898 B.H.FLYNN
SCALE IN FEET
Slaughter House
Sandusky St.
Ice
Dam
Gas Wks
Water Works
Dam
Dam
Ice
C. S. & H. R. R.
Dam
Brewery & Ice Plant
Mansfield St.
P. F. W. & C. R. R.
Dump
Mary St.
Galen St.
Mansfield St.
Rensselear St.
Warren St.
Charles St.
Slaughter House
Ditch
Slaughter House
Slaughter House
Cemetery St.
Spring St.
Poplar St.
Sandusky St.
Walnut St.
Rogers St.
Galion St.
T. & O. C. R. R.
Oakwood Cemetery
Marion St.
C. S. & H. R. R.
To Scioto River
Sewers
Rail Roads
Corporation Line
Sample Points

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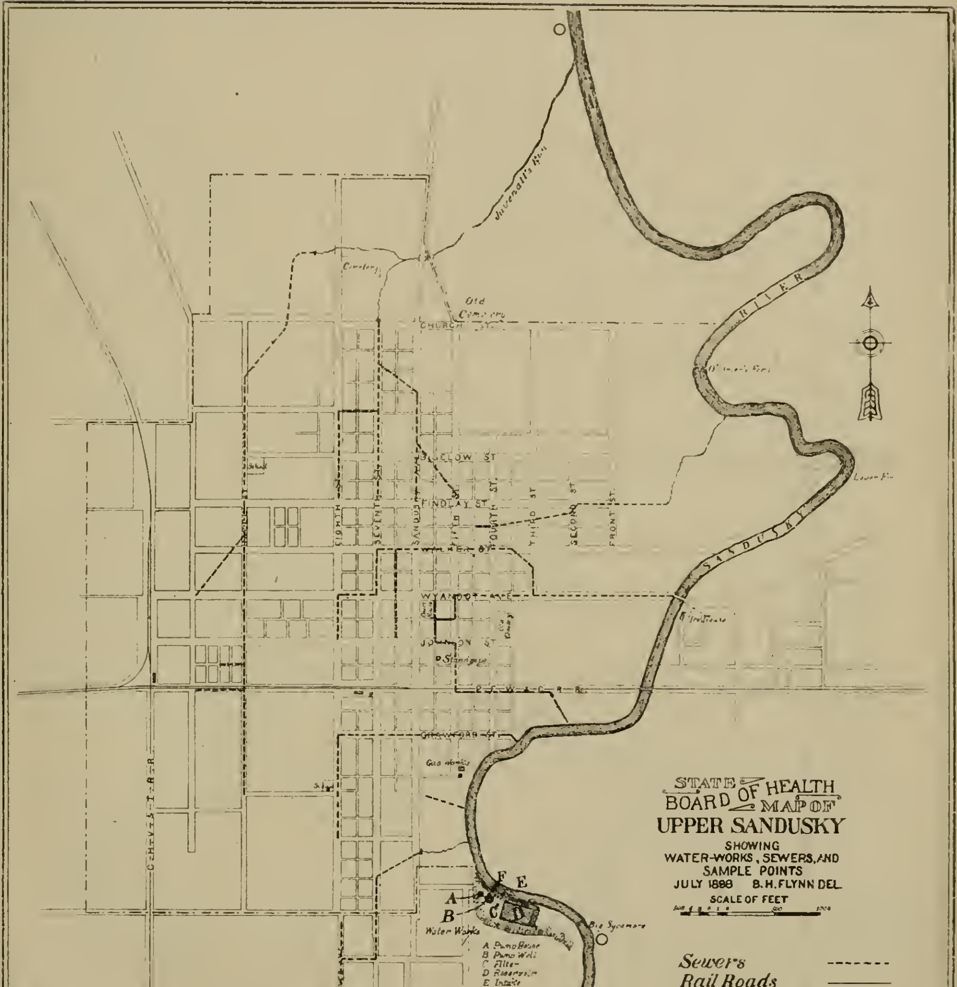
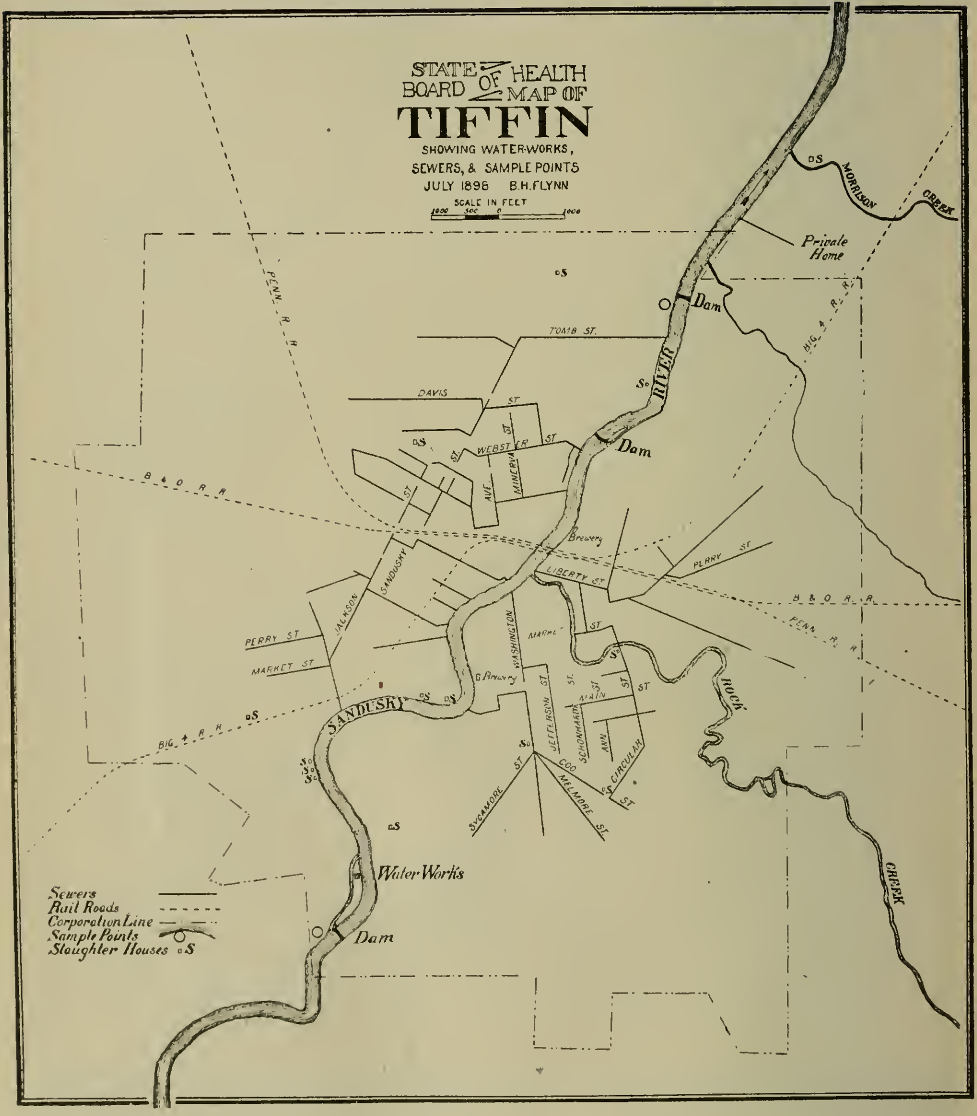
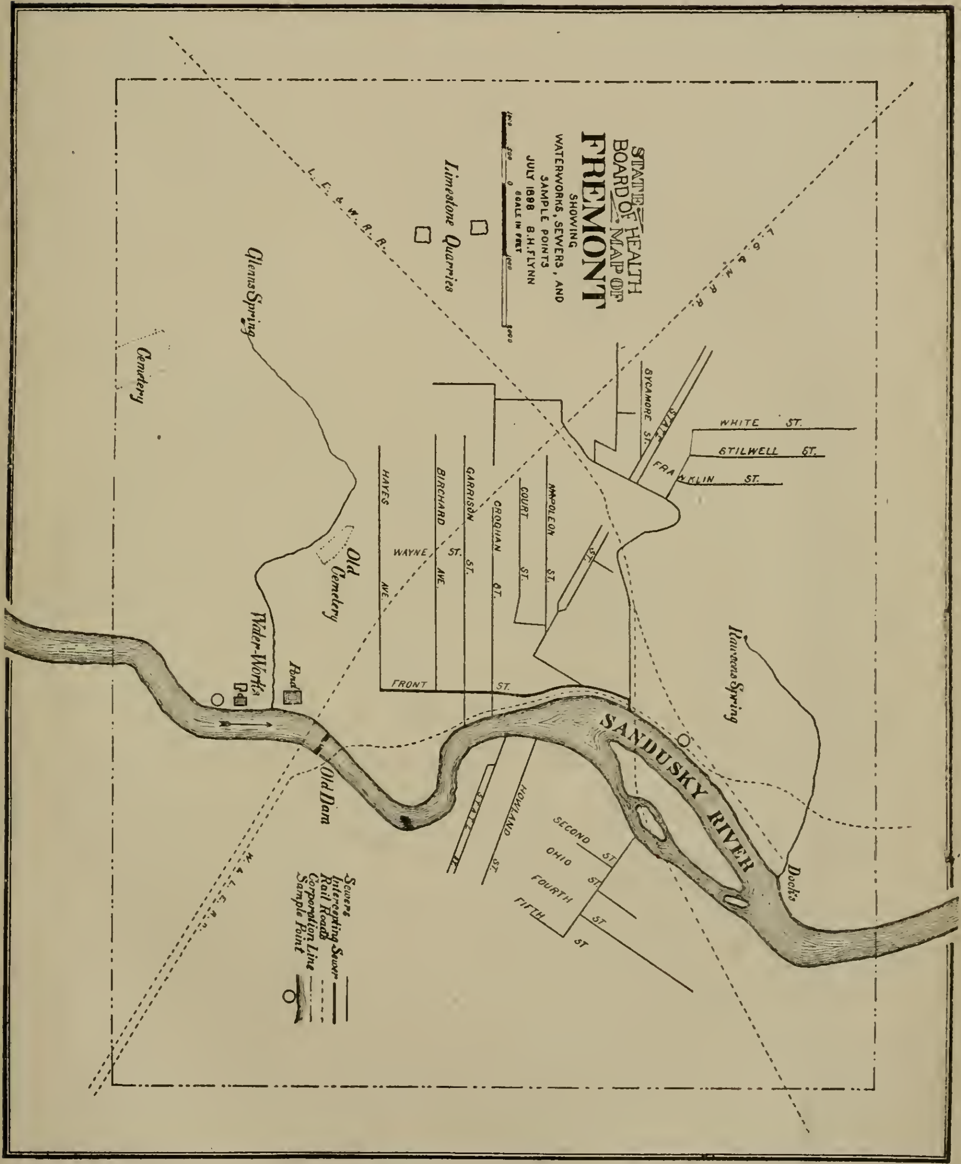
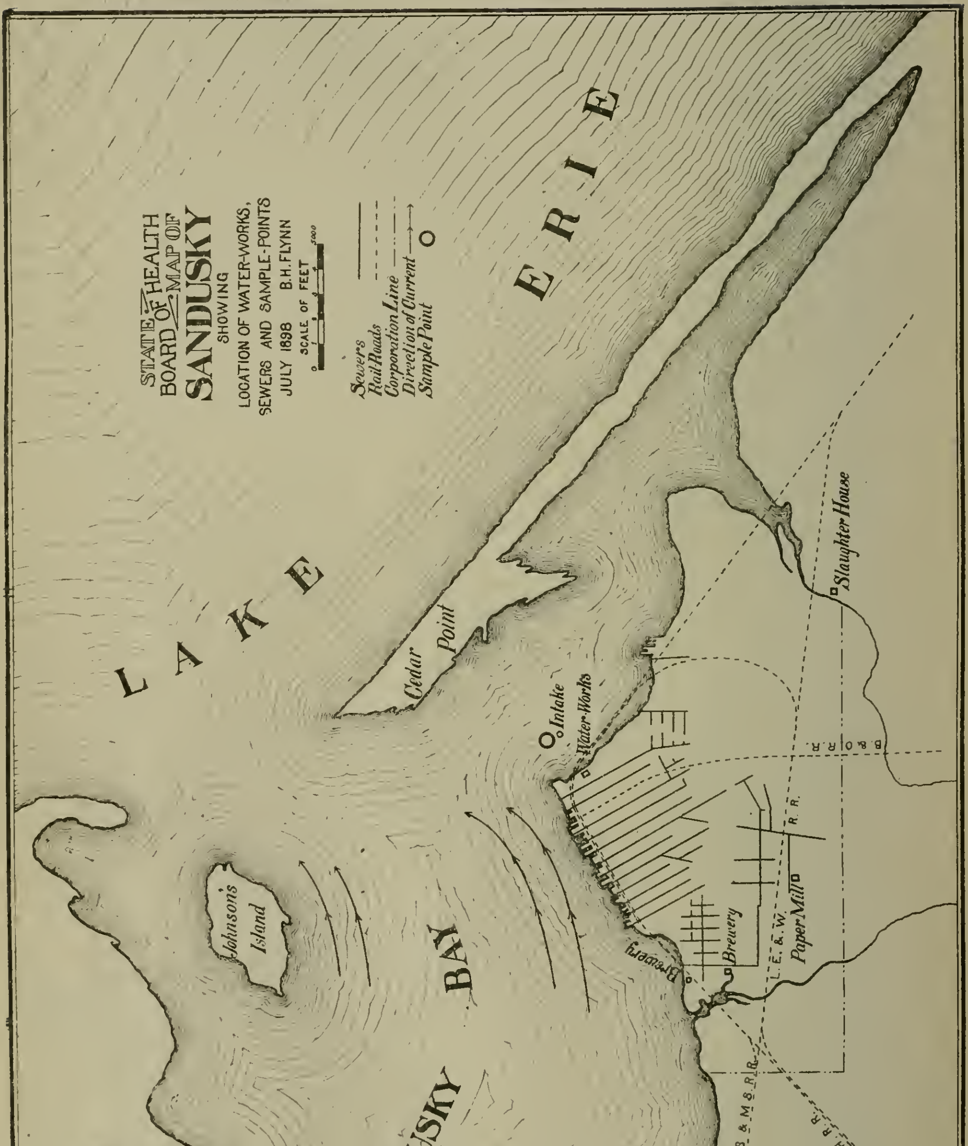



STATE BOARD OF HEALTH MAP OF
TIFFIN
SHOWING WATER-WORKS,
SEWERS, & SAMPLE POINTS
JULY 1898 B.H. FLYNN
SCALE IN FEET
1000 500 0 1000
Sewers
Rail Roads
Corporation Line
Sample Points
Slaughter Houses S
SANDUSKY RIVER
ROCK CREEK
MORRISON CREEK
Private Home
Dam
Dam
Dam
Water Works
Brewery
Brewery
PENN. R. R.
B & O R. R.
BIG 4 R. R.
TOMB ST.
DAVIS ST
WEBSTER ST
MINERVA ST
AVE.
SANDUSKY
JACKSON
PERRY ST
MARKET ST
LIBERTY ST
WASHINGTON
MARKET
JEFFERSON ST.
SCHONHARDT ST.
MAIN ST
ANN ST
CIRCULAR ST
COE
MELMORE ST.
SYCAMORE ST
PERRY ST
S


STATE BOARD OF HEALTH
MAP OF
FREMONT
SHOWING
WATERWORKS, SEWERS, AND
SAMPLE POINTS
JULY 1888 B.H. FLYNN
SCALE IN FEET
500
0
1000
2000
Limestone Quarries
L. E. & W. R. R.
L. S. & M. S. R. R.
W. & L. E. R. R.
Glenns Spring
Cemetery
Old Cemetery
Water-Works
Pond
Old Dam
SYCAMORE ST.
STATE
WHITE ST.
STILWELL ST.
FRANKLIN ST.
NAPOLEON ST.
COURT ST.
CROGHAN ST.
GARRISON ST.
BIRCHARD AVE.
HAYES AVE.
WAYNE ST.
FRONT ST.
ST.
SANDUSKY RIVER
Hawsens Spring
Docks
STATE ST.
HOWLAND ST.
SECOND ST.
OHIO ST.
FOURTH ST.
FIFTH ST.
Sewers
Intercepting Sewer
Rail Roads
Corporation Line
Sample Point


STATE BOARD OF HEALTH
MAP OF
SANDUSKY
SHOWING
LOCATION OF WATER-WORKS,
SEWERS AND SAMPLE-POINTS
JULY 1898 B.H. FLYNN
SCALE OF FEET
0
1
2
3
4
5000
Sewers
Rail-Roads
Corporation Line
Direction of Current
Sample Point
LAKE
ERIE
Cedar Point
Intake
Water-Works
Slaughter House
B. & O. R. R.
R. R.
Johnson's Island
SANDUSKY BAY
Brewery
Brewery
Paper Mill
L. E. & W.
L. S. & M. S. R. R.
C. S. & H. R. R.

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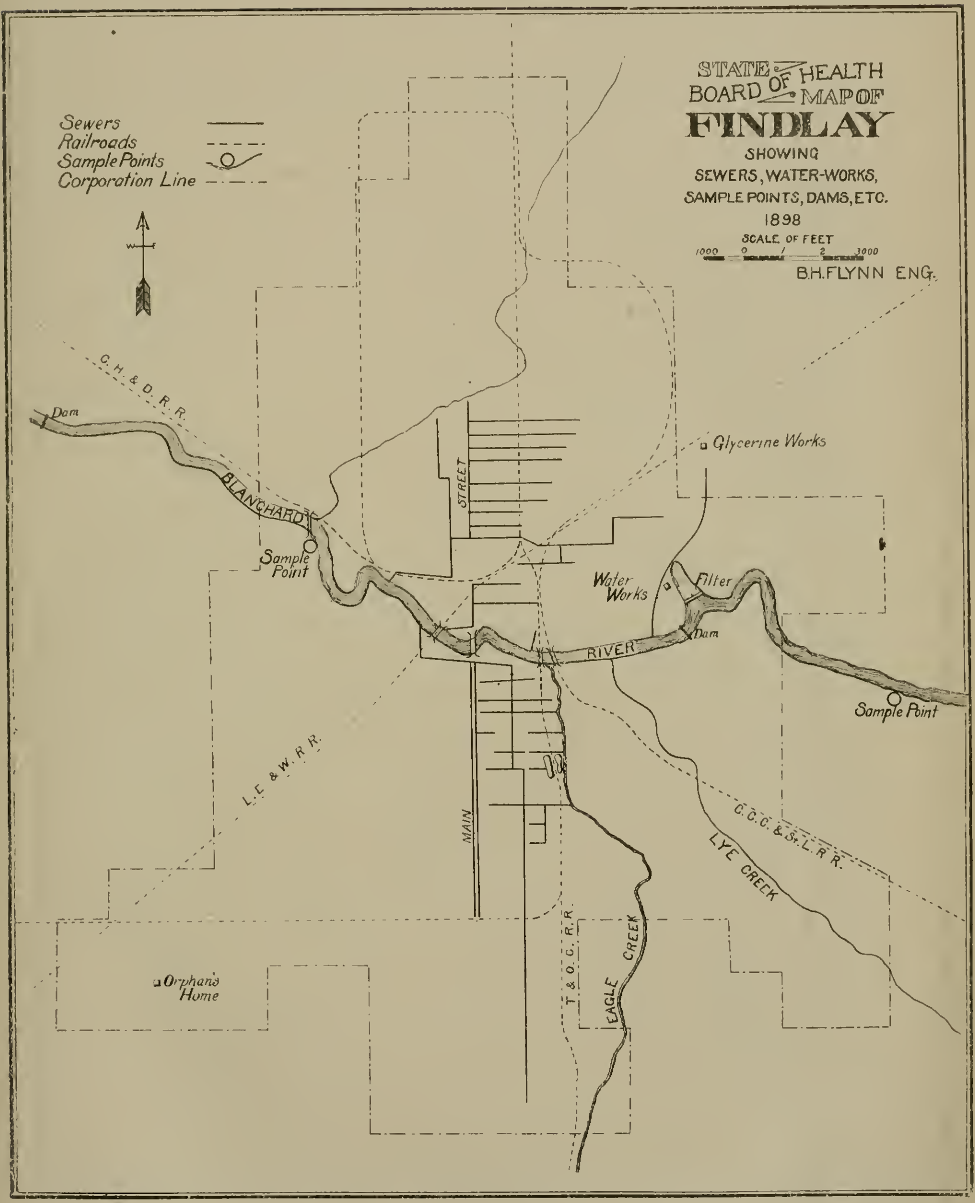

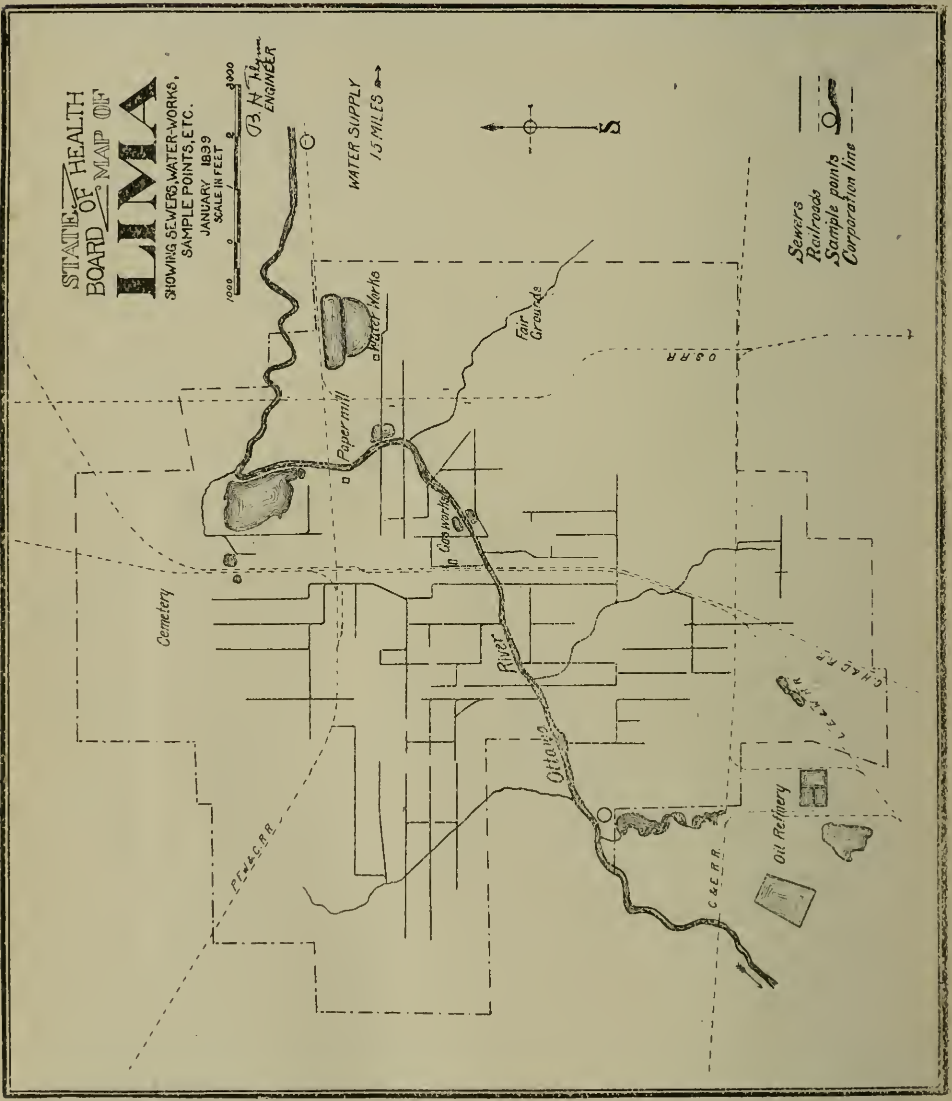
STATE BOARD OF HEALTH
MAP OF
LIMA
SHOWING SEWERS, WATER-WORKS, SAMPLE POINTS, ETC.
JANUARY 1899
SCALE IN FEET
1000
0
1
2
3000
B. H. Flynn
ENGINEER
WATER SUPPLY
1.5 MILES
S
Water Works
Fair Grounds
O.S.R.R.
Paper mill
Gas works
Cemetery
River
Ottawa
C.H.&D.R.R.
L.E.&W.R.R.
Oil Refinery
C.&E.R.R.
P.Ft.W.&C.R.R.
Sewers
Railroads
Sample points
Corporation line

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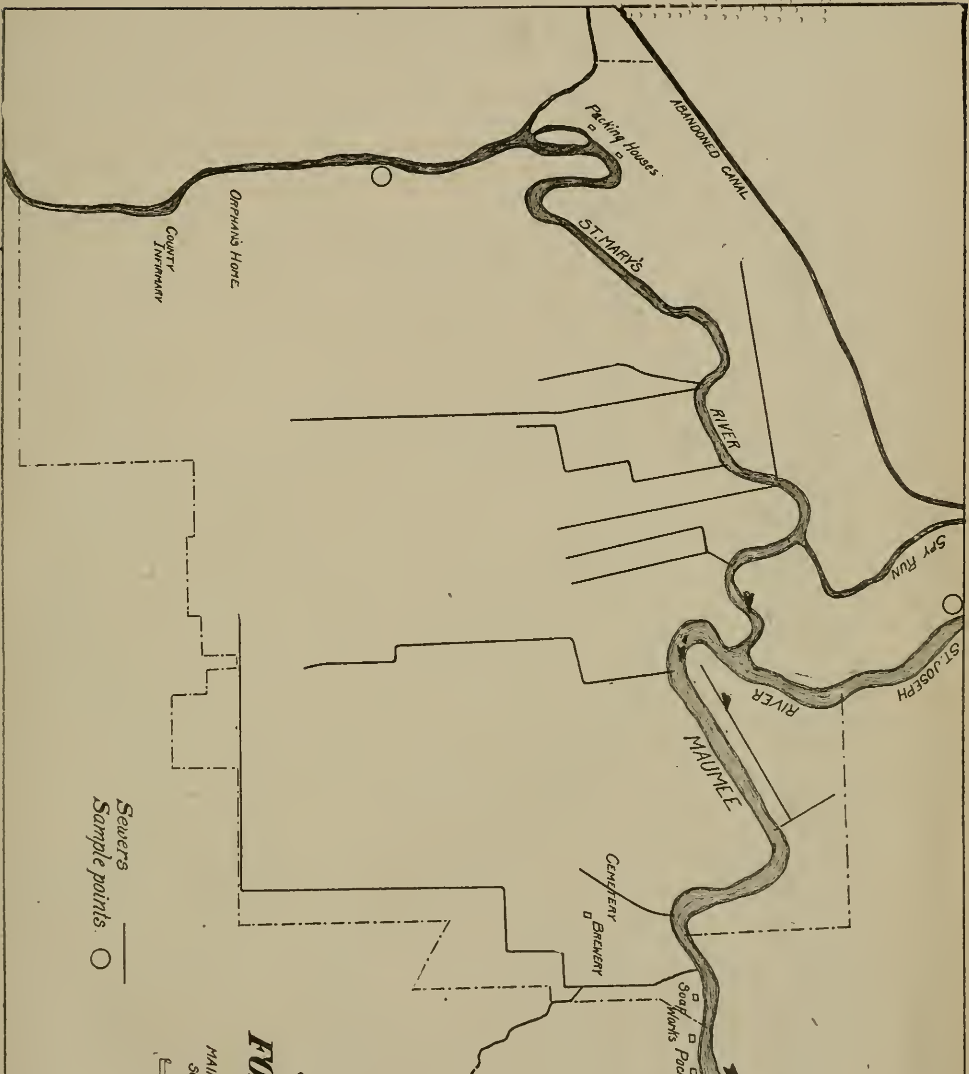
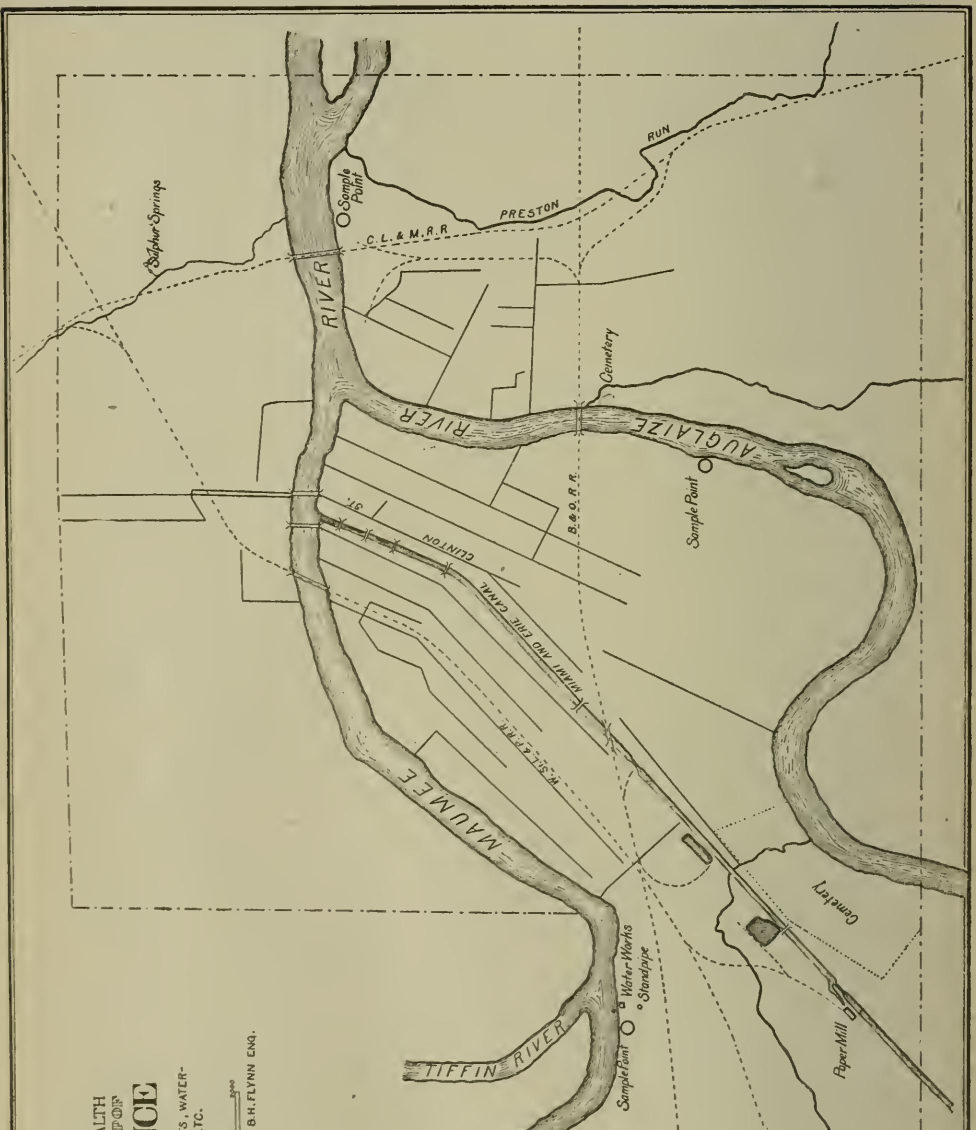
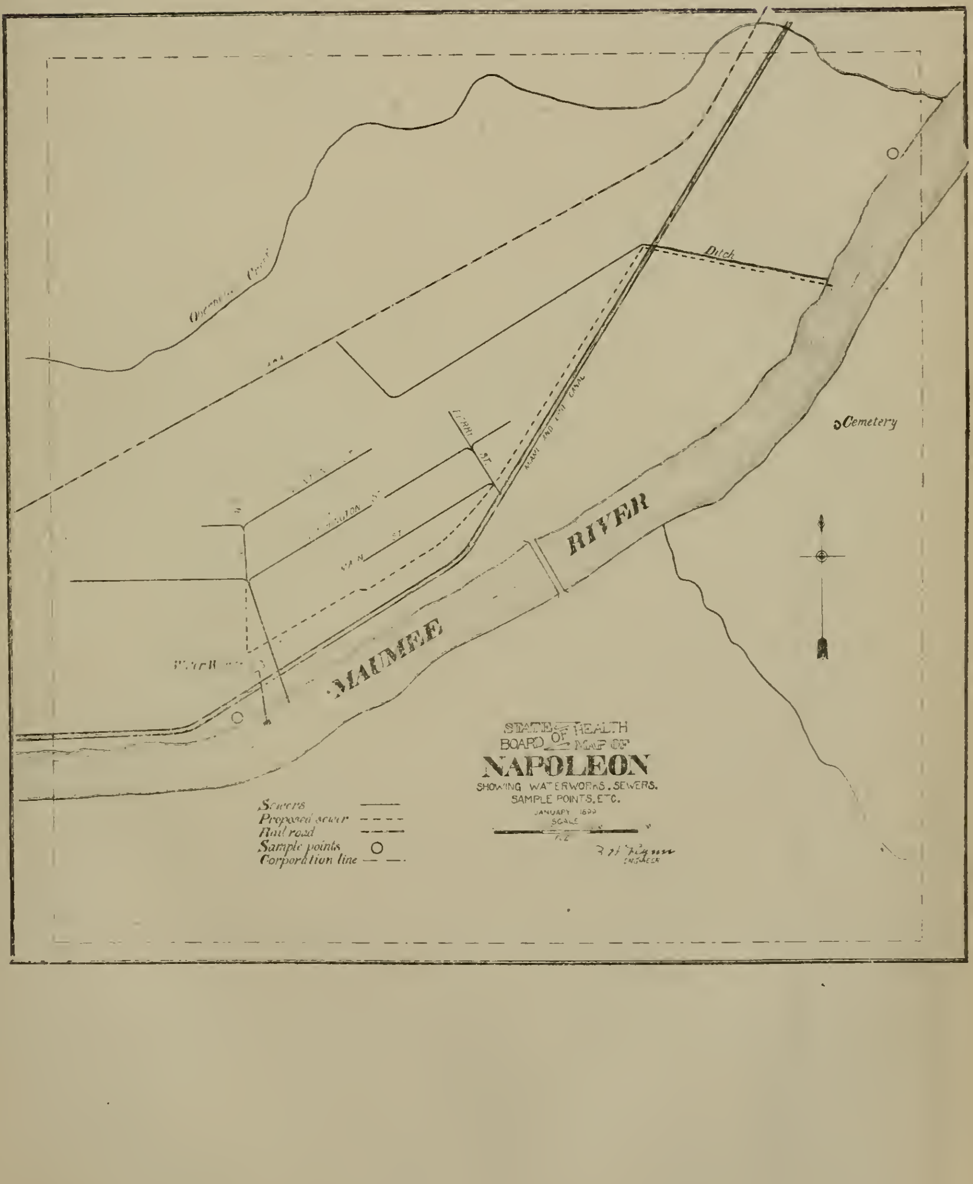
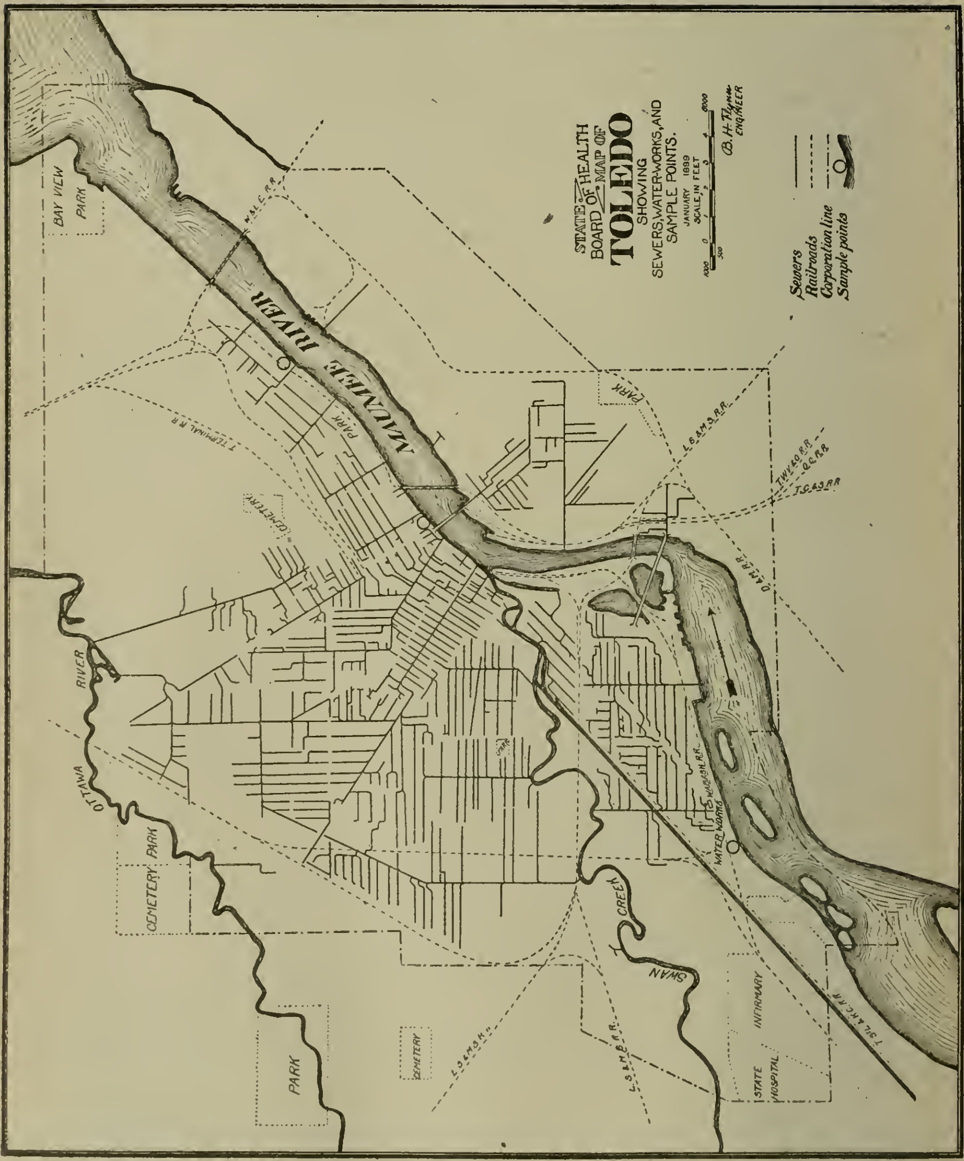



STATE BOARD OF HEALTH
MAP OF
DEFIANCE
SHOWING
SEWERS, SAMPLE POINTS, WATER-WORKS, DAMS, ETC.
1898
SCALE OF FEET
2000
B.H. FLYNN ENG.
Sewers
Railroads
Corporation Line
MAUMEE RIVER
AUGLAIZE RIVER
TIFFIN RIVER
PRESTON RUN
C.L.&M.R.R
B.&O.R.R.
W.St.L.&P.R.R
MIAMI AND ERIE CANAL
CLINTON ST.
Sample Point
Sample Point
Sample Point
Sulphur Springs
Cemetery
Cemetery
Water Works
Standpipe
Paper Mill


Ditch
Cemetery
RIVER
MAUMEE
STATE OF HEALTH
BOARD OF MAP OF
NAPOLEON
SHOWING WATERWORKS. SEWERS.
SAMPLE POINTS. ETC.
JANUARY 1899
SCALE
ENGINEER
Sewers
Proposed sewer
Rail road
Sample points ○
Corporation line


STATE BOARD OF HEALTH
MAP OF
TOLEDO
SHOWING
SEWERS, WATER-WORKS, AND
SAMPLE POINTS.
JANUARY 1899
SCALE IN FEET
1000 500 0 1 2 3 4 5000
B. H. Flynn
ENGINEER
Sewers
Railroads
Corporation line
Sample points
MAUMEE RIVER
OTTAWA RIVER
SWAN CREEK
BAY VIEW PARK
PARK
CEMETERY
CEMETERY PARK
STATE HOSPITAL
INFIRMARY
WATER WORKS
T. TERMINAL R.R.
L.S.&M.S.R.R.
WABASH R.R.
T.W.V.&O.R.R.
O.C.R.R.
T.S.&S.R.R.
D.&M.R.R.
T.S.L.&K.C.R.R.

REPORT ON THE CHEMICAL AND BACTERIOLOGICAL EXAMINATIONS OF THE WATERS OF THE SANDUSKY AND MAUMEE RIVERS.

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The systematic examination of the river waters of Ohio commenced in 1897 will extend over a period of several years, and, accordingly, it is desirable that the work of each year be presented in such form as to make the results readily comparable with those of the preceding years. To this end we have followed in the main the very satisfactory methods employed last year by Prof. N. W. Lord and Dr. A. M. Bleile in their work upon the Scioto, Olentangy and Mahoning rivers. There is however, one marked departure from the preceding work, and one which must constantly be borne in mind to avoid confusion. We refer to the method of expressing the results. All numerical results, except for color, dissolved oxygen and bacteria, are expressed in *parts per million*, and not in parts per one hundred thousand, as in the preceding work. This change was made at this time, rather than later, because the growing tendency among scientific workers is so strongly in favor of the more convenient milligrams per litre by weight (parts per million) that we believe the one method of expressing results will soon prevail. Parts per hundred thousand should be multiplied by ten before comparison is made with parts per million.

All of the examinations and collections were made by the writer The temperature reading, the test for dissolved oxygen, and the pouring of plates for determining the number of bacteria, were made at the river bank at the time of sampling. The remaining determinations were made in the Laboratory of the Ohio State Board of Health from a bottle of water taken at the time of sampling, then securely locked in a wooden box prepared for the purpose, and shipped by express to the laboratory. These bottles hold about one gallon each and are supplied with ground glass stoppers. As soon as the samples reached the laboratory the bottles were removed from the wooden boxes and placed in a refrigerator kept well supplied with ice. Some criticism has been made because of delay which would result from collecting and analyzing of the samples by the same person. While it would have been desirable to have had two workers on the laboratory staff, yet the funds at the disposal of the Board would not permit such a course. Moreover, the delay is not so great as it would seem at first thought. Under the most favorable circumstances samples collected in the forenoon would reach the laboratory too late to be examined that day. On the other hand many of the samples would not reach the laboratory even the next day after collection. By reference to last year's report (pages 54 59) it will be seen that about one-fourth of the samples did not reach the analyst until the second day after their collection. In the present work the writer was able to complete the trip over either watershed and reach Columbus again on the third evening. It was actually found that with the same person doing both collecting and analyzing that fifty (50) per cent. of the samples received no delay whatever in beginning of the examination, and that the analysis of no sample was delayed beyond forty-eight hours from what it would have been with an additional person to do the collecting. Furthermore, the research work (not yet published) of Mr. F. O. Clements, Fellow at the Ohio State University, 1898 99, shows that the most rapid change is a great increase in nitrates. In the majority of the samples in the present report the nitrates were not excessive, and when they were it was true of all samples regardless of any delay in analysis. We do not claim that some changes did not occur, but we do believe that they were not of such moment as to materially affect the comparability of results.

The first steps in the analysis were to determine the condition of the organic matter present, then the physical characters, chlorine, total solids, alkalinity and incrusting constituents. Before beginning the analysis of a sample, the neck of the bottle was held under the tap to wash away any dust and then rinsed with distilled water.

As soon as the examination was completed the bottle was thoroughly cleansed and rinsed, and in addition, before again sending out the bottles, they were rinsed with ammonia free water, and this water was Nesslerized to see if any ammonia was present.

The plan of the work consisted in the chemical and bacteriological examination of samples taken at regular places in the Sandusky and Maumee rivers each month from July to November inclusive. The regular places for sampling were chosen above and below the known sources of pollution. When any city used the river water for a public supply the above-town sample was taken at or near the water works. The series of examinations enables us to arrive more correctly at the sanitary value of the water supplied in this way to the consumers.

A comparison of the results below any particular pollution with the results obtained above that disturbance shows the extent of the impurity added. On the other hand, a comparison of the results below a pollution with the results at the next station down the river shows the amount of purification which has taken place. The results yield information upon urban and rural sewage pollution, specific pollutions of various kinds, and purification questions.

METHODS.

Color. The color was determined by Hazen's platinum cobalt method. *American Chemical Journal, XIV, p.* 300. A solution with a color 5 is made by dissolving 1.246 grams of bichloride of platinum and potassium in water, adding 1 gram of cobalt chloride and 100 c. c. of concentrated hydrochloric acid, then diluting to 1 litre. From this solution weaker standards are prepared and kept in bottles for comparison with the water to be examined. A standard of .1 color is obtained by diluting the strong solution 1 to 50, .2 by 2 to 50, .3 by 3 to 50, etc. Turbid waters were filtered before being tested for color. The comparison of the water with the standards was made in tall Nessler tubes by looking through the tubes lengthwise against a pure white surface.

The *turbidity* and *sediment* were determined by inspection of the water in the sample bottles after standing over night. The turbidities were expressed as follows: None, very slight, slight, distinct, decided, and are indicative of the suspended matter present, chiefly in the form of soil (clay) and low forms of animal and vegetable life. Frequently one of the most, if not the most objectionable feature of a water, from the consumer's standpoint, is its appearance or turbidity.

The river waters of Ohio are quite turbid, if the streams under discussion in this report are representative streams. With the surface waters in some sections so badly polluted as to be at least suspicious in character, an increased population will necessitate purification plants if the rivers continue to be the source of public supply for many of our towns and cities. The suspended clay in a water is extremely difficult of removal by filtration, and yet is such an important factor in turbidities that it makes it advisable to have more expressive terms for turbidities than adjectives.

The sediments were mostly composed of depositions of the larger soil particles, higher plant forms, and the remains of decaying organic matter, either of vegetable or animal nature. Sediments were spoken of as none, very slight, slight, considerable and much. In the tables the expressions for turbidities and sediments are abbreviated as follows: Very slight, v. s.; slight, s.; distinct, dis.; decided, dec.; considerable, c.; and much, m.

The *odor* was determined at room temperature by shaking a partially filled sample bottle, which had stood over night, and applying the nose to the mouth of the bottle at the moment the stopper was withdrawn. In a few cases the odor was also taken from some of the water heated almost to boiling in a clean flask.

The amount of *oxygen required* was found by the well known Kübel process, using 100 c. c. of water and boiling gently for ten minutes. The tests were made in 200 c. c. Erlenmeyer flasks previously freed from organic matter. To the water was added 5 c. c. of 25 per cent. H_2SO_4 (free from organic matter) and a known amount of the permanganate solution (8 to 10 c. c.). More permanganate was added if the red color began to fade during boiling. At the end of the ten minutes, exactly 10 c. c. of oxalic acid solution was added and the titration completed with the permanganate. The amount of permanganate used, less the equivalent of the 10 c. c. of oxalic acid, gave the amount of oxygen required. The strengths of the permanganate solution and the oxalic acid were as 1 : 1, but a titration was made each day they were used to determine exactly their relative values. Ten c. c. of the dilute oxalic solution was equivalent to 1 mgm. of oxygen. The samples were well shaken before the portion was taken for examination.

The *nitrogen* in the form of *free and albuminoid ammonia* was determined by the Wanklyn process, as modified by Drown, Hazen and Clark. The method is that used by the Massachusetts State Board of Health, report 1890, and by Prof. N. W. Lord, in the work of 1897, for the Ohio Board. In brief, it consists in distilling from flasks or retorts containing 500 c. c. of the sample three distillates of 50 c. c. each for the free ammonia, then after the addition of 40 c. c. of alkaline permanganate, five more distillates are obtained for the albuminoid ammonia. The time of each distillate was kept as nearly as possible at fifteen minutes. The condensing tubes were kept cold by running water. The flasks, retorts, and condensing tubes were tested in place each time before using, to show they were free from ammonia. All Nessler tubes were also tested before using. The only acid samples were the August ones from Findlay, and these were the only ones made alkaline by the addition of sodium carbonate. Clean pumice stone, in small granules, previously heated for two hours, prevented "bumping." The permanganate was tested in blank when made up, then heated to boiling for some minutes before using. It was prepared from the customary formula, as was the Nessler's re-agent. Each preparation of the stock solutions was tested with the preceding, and no appreciable variation found.

Standards were prepared for each day's reading by adding known quantities of an ammonium chloride solution to 50 c. c. tubes of ammonia free water. The standards and distillates, protected from contamination, were allowed to come to a uniform temperature by standing, then Nesslerized and the readings taken after fifteen minutes, when the colors had become constant. The Nessler tubes were 300 mm. long, with an interior diameter of 18 mm. Distillates rich in ammonia were diluted in aliquot parts. When a water was known to be impure less than 500 c. c. was taken and diluted to that amount with ammonia free water. Before taking the portion desired for the examination the water in the sample bottle was well shaken.

The determination of the *nitrogen as nitrites* was made by the Griess-Warrington method as described in Report of the Massachusetts State Board of Health for 1890, (part 2, p. 715). In turbid waters a portion was first shaken up with hydrate of alumina, and quickly filtered through a paper filter which had been washed free of nitrous acid. In each case 50 c. c. of the water in question was taken and the test made in tall Nessler tubes by comparing the depth of color with that in standards made up in similar tubes from nitrite free water and known quantities of sodium nitrite. The readings were made thirty minutes after the addition of the solutions, the tubes meanwhile having been protected so as to prevent absorption of nitrites from the air or dust.

The *nitrogen as nitrates* was determined, with slight modifications, by the indigo process as given in Sutton's Volumetric Analysis, 7th edition, p. 469. The phenoldisulphonic acid method was not employed as the determination of free and albuminoid ammonia is carried on in both rooms of the laboratory, thus preventing there the use of ammonia. Aluminum foil for the aluminum reduction process had been ordered but was so long delayed in reaching us that the first determinations were of necessity made by the indigo process, and no change was subsequently made.

Chlorine. The amount of chlorine was found by the well known process of titration with silver nitrate, using potassium chromate as an indicator. See Hazen, *American Chemical Journal*, *Vol. XI p.* 409. Blank determinations furnished the data for correction, for volume and quantity of silver chloride. These tests were made by artificial light. Turbid waters were clarified by shaking with hydrate of alumina. The waters were so very high in chlorine that the addition of sodium chloride solution was not thought of, and some of the samples were diluted. In each case 100 c. c. was used, and the end reaction found by comparison with a prepared flask containing the same volume.

Alkalinity. This was determined by the Hehner method of titration with one-fiftieth normal sulphuric acid using lacmoid as an indicator. Fifty c. c. of the water were heated almost to boiling for the titration and the results were expressed as calcium carbonate in milligrams per litre.

The Hehner method was likewise used to determine the *incrustin* *constituents.* See *Analyst*, (*Vol. VIII, p.* 77.) As in the work of last year the lack of a sufficient number of platinum dishes necessitated the use of porcelain. Blank determinations were run each time and corresponding connections made. To 50 c. c. of the water under examination was added a measured amount of a fiftieth normal sodium carbonate solution, and the mixture evaporated to dryness. The soluble salts were carefully washed through a small filter with freshly boiled distilled water, the filtrate titrated with fiftieth normal sulphuric acid, and the difference between this result and the amount from the sodium carbonate in the blank taken as representing the sulphates and chlorides of calcium and magnesium expressed as calcium carbonate.

Like Prof. Lord we found the soap test very unsatisfactory for the hard waters found in Ohio streams, but the Hehner test yielded excellent results.

Total solids and loss on ignition. The sample was well shaken, 100 c. c. taken, and evaporation to dryness and constant weight effected. The ignition was carried as uniformly as possible to a faint visible redness until the carbonaceous matter was gone.

The test for *dissolved oxygen* was of necessity made at the river bank, with strict precautions observed in taking the sample so as to guard against error due to increase of oxygen by virtue of bringing the water in contact with air through careless manipulation. Winkler's method was employed as follows: A narrow neck bottle of known capacity (165.5 c. c.) with a close fitting ground glass stopper, was immersed in the stream and allowed to fill, then by means of a rubber tube with one end extending to the bottom of the bottle and having at the other end a rubber bulb used as a suction pump, a quantity of water, equal to several times the capacity of the bottle, was drawn through the bottle which was kept immersed all the time. Finally the tube was withdrawn, the stopper inserted, and the bottle lifted from the stream. With fine pointed pipettes ½ c. c. of a clear saturated solution of manganous sulphate and 1 c. c. of a potassic iodide solution (100 grams potassic iodide and 360 grams caustic soda in one litre of water) were successively introduced beneath the surface, and the stopper at once replaced, care being taken to include no bubbles of air. The bottle was turned so as to thoroughly mix the contents, and then allowed to stand until the precipitate settled. Five c. c. of the 25 per cent. solution of sulphuric acid was similarly introduced and the contents again well mixed, when there was set free iodine in proportion to the free oxygen previously in the water. The amount of iodine was found by titration against a hundreth normal sodium thiosulphate, using starch as an indicator. The titration was made in a porcelain casserole. The amount of dissolved oxygen was computed from the thiosulphate used, and was expressed in percentage of the amount held by distilled water at that temperature when saturated by shaking with air. We used the table for saturations given by Prof. Lord's report last year and which is repeated below.

As in preceding work on streams in this State there were found at times, amounts of dissolved oxygen greater than those given in the tables for saturation. We believe these high results are reliable, and that their occurrence is consistent with the attending conditions. These supersaturations occurred chiefly in July and August, and were doubtless due to the oxygen given off by growing plants. In Annuaire de L'Observatoire Municipal de Montsouris pour l'an, 1890, we find work which bears out the supersaturations we have more recently found. That report, p. 250, in speaking of dissolved oxygen in waters, says, "Cet oxygène provient de l'air dessous dans plus loin, du produit de la nutrition des algues qui vivent dans cette eau." On pages 260 and 261 we find a table showing the decrease of oxygen in water due to microbic life, and the following table showing the increase of free oxygen resulting from the presence of growing algae:

Eau de Vanne (contained)	11.1	milligrammes.
" " apres 9 jours	20.2	"
" " " 60 "	39.7	"

The temperature was not given, but the amount of dissolved oxygen had increased after nine days to supersaturation if computed in percentage of saturation from the usual tables, and had increased still more at 60 days. "Ces résultats différentes proviennent de la plus ou moins grande quantité dans les eaux de matières organisées vivantes, les unes chlorophyllées, les autres non-chlorophyllees, des algues et des bacteries par exemple." That is they found a water containing chlorophyll plants as algae increased in its amount of dissolved oxygen, while water rich in bacterial life lost free oxygen on standing.

Saturation tables are prepared from results obtained by shaking water with air, which contains only some 20 per cent. of oxygen. The gas given off by algae is nearly pure oxygen, and consequently a water would take up about five times as much oxygen from it as from the same volume of air, temperature and pressure remaining the same. It would have been extremely desirable could the waters yielding the higher results have been examined biologically, but the demands of the routine work permitted no time for even a slight investigation as to the nature of the plants occurring in those waters.

QUANTITIES OF DISSOLVED OXYGEN IN PARTS PER MILLION, BY WEIGHT, IN WATER SATURATED WITH AIR AT THE TEMPERATURE GIVEN.

(Milligrammes per Litre.)

Temperature C.	Oxygen.	Temperature C.	Oxygen.
0	14.70	16	9 94
1	14 27	17	9 74
2	13 87	18	9.55
3	13 50	19	9.37
4	13.15	20	9 19
5	12.82	21	8.97
6	12 48	22	8 84
7	12 17	23	8.67
8	11.87	24	8.51
9	11.58	25	8.35
10	11.31	26	8.19
11	11 06	27	8.03
12	10 82	28	7.90
13	10.59	29	7.74
14	10.36	30	7.60
15	10.14		

BACTERIOLOGICAL METHODS.

It is a source of regret that we were unable to include in this work a systematic search for intestinal bacteria in each sample. It was only by earnest work and long hours that the amount of work accomplished in the laboratory was attained, and therefore the qualitative examination for members of the colon group of bacilli was of necessity deferred until more assistance could be provided. We hope to be able to include in future reports information concerning the presence or absence of intestinal bacteria. Still, as has been said, much can be gained from a knowledge of merely the number of germs present, and this, when considered with the chemical findings, is of great assistance in determining the sanitary value of a water. Sudden or great fluctuations in the number of bacteria do not come without cause.

The number of bacteria was determined by the usual quantitative method in vogue, using agar and petri plates. We used the usual nutrient agar, containing 12 grams of agar to the litre.

The reaction of the culture medium in water analysis is an item of great importance, as frequently marked variations are obtained in the number of bacteria from the same sample when media of different reactions are employed. In all our work the reaction was 1.5 per cent. acid as has been the practice of the writer for the past few years. This reaction means that it would require 15 c. c. of a normal alkali solution to be added to one litre of the medium to bring it to the phenolphthalein neutral point. This medium then is acid to phenolphthalein and alkaline to litmus. Agar was chosen in preference to gelatine, because the latter would not stand the heat of our summers, and it was not practicable to maintain the gelatine at a low temperature in the collector's case while traveling.

The growths developed at ordinary temperatures, and counts were made at the laboratory at the end of three days in hot weather and four days in the fall. This was possible, as the length of the trips always permitted the bacteriologist to be in the laboratory by the time the first plates were 72 hours old. To avoid bacterial changes in transportation all plates were poured at the river bank, and no trouble was found in accomplishing this satisfactorily. The agar was liquefied in the flame of an alcohol lamp, and the tubes placed in a water bath at 42° C. for a few minutes. Usually .5 and 1 c. c. were the amounts of water used for the plates, but in waters known to be badly polluted, dilutions with sterile distilled water were made. Two plates were poured at each station and the mean taken as the final result, the figures showing the number of bacteria in 1 c. c. of the original water.

The pipettes, petri plates and test tubes for taking the samples were sterilized at the laboratory before starting on the trip, and no tube or pipette was used again until cleaned and resterilized.

The plates were placed in pairs in pasteboard boxes made for the purpose, while the pipettes were sterilized and carried singly in small brass tubes plugged with cotton at either end.

It is essential in forming an opinion of a river water from the findings of the chemical and bacteriological analyses to bear in mind the effects produced in streams by the addition of rain water. As rains occur at irregular intervals and with no uniformity of fall, the time and extent of the precipitation must be noticed. In addition to the influence of the rain water itself there must be considered a usually more important factor resulting therefrom, viz., the nature of the substances brought into the river by the consequent surface washings and the effect thus produced upon the water.

To this end the following rainfall table has been compiled from the monthly reports of the United States Weather Bureau. Thanks are due Mr. J. Warren Smith, Director of the Ohio Section, for courtesies extended and for the interest shown in making the work of the Weather Bureau of assistance to us by locating observing stations at desirable points on the watersheds.

The table includes the date and the amount of rainfall (when there was a precipitation of one-tenth inch or more) for all observing stations of the Bureau located upon the areas drained by the Sandusky or Maumee rivers and their tributaries. The sum of the amounts given may not equal the total for the month, as precipitations of less than one-tenth of an inch have been omitted.

RAINFALL TABLE.

DAYS ON WHICH ONE-TENTH INCH OR MORE RAINFALL OCCURRED—SANDUSKY RIVER BASIN.

Station.	July.	Rain.	August.	Rain.	September.	Rain.	October.	Rain.	November.	Rain.
Bucyrus	15	.10	3	.80	22	.19				
“	16	.20	4	.30	23	.96				
“	18	1.00	8	.30	24	.21				
“	19	.80	9	.30						
“	21	.50	17	.30						
“	25	.10	19	.50						
“	28	.10	25	2.00						
“	29	.10								
“	30	.25								
Total rainfall by months		3.15		4.50		1.55				
Variation from the normal at station		—.11		+1.96		—.89				
Upper Sandusky	3	.51	2	.27	4	.92	4	1.55	5	.85
“	14	1.02	3	.79	5	.35	11	.86	9	1 85
“	15	.11	8	1.00	17	.95	17	.58	22	.35
“	17	.42	16	.10	21	.57	21	.78	26	.20
“	18	.50	18	.90	22	20	26	.27	29	.25
“	20	.80	24	.65	24	.10				
“	25	.21			30	.55				
“	27	.15								
“	28	.30								
Total rainfall by months		4.11		3.78		3.64		4 03		3.50
Variation from the normal at station		+.99		+1.07		+1.15		+1.79		+.25
Tiffin	17	.24	3	.68	4	2.69	4	1.54	5	.47
“	20	.68	8	1.18	6	.64	5	.66	9	1.23
“	25	.11	16	1.08	15	.31	11	.48	10	.61
“	29	.60	17	1.44	22	.47	18	.32	26	.25
“	30	.29	18	2.26	24	.29	21	.20		
“			24	.65	2[illegible]	.35	22	.58		
“							26	.23		
“							30	.12		
Total rainfall by months		2.06		7.42		4.89		4.30		2.97
Variation from the normal at station		+1.49		+4.61		+2.83		+1.70		—.45
Vickery	4	.32	3	.71	4	1.16	4	2.32	5	.35
“	17	2 50	8	.60	6	.35	5	.50	9	1 22
“	19	.15	12	.18	15	.32	11	.90	10	.80
“	20	.86	17	1.72	18	.10	18	.35	26	.16
“	24	.22	24	.23	22	.27	21	.50		
“	25	.78			23	.61	22	.44		
“	28	.41			24	.14	26	.15		
“	30	1.50								
Total rainfall by months		6.75		3.60		2.99		5.28		2.72
Variation from the normal at station		+2 65		+1.77		+.66		+2.61		—.49
Average for whole basin by months		4.02		4.82		3.27		4 54		3.06
Average variation from normal for the whole basin		+2.04		+2.35		+.94		+2.03		—.23

MAUMEE RIVER BASIN.

Station.	July.	Rain.	August.	Rain.	September.	Rain.	October.	Rain.	November.	Rain.
Findlay	3	.19	2	.21	4	1.72	3	.19	5	.67
“	8	.74	3	.11	5	.29	4	1.62	8	.60
“	14	.15	7	1.62	14	.34	10	.24	9	1.08
“	16	.32	8	.15	17	.21	11	.18	10	.21
“	25	.38	11	12	22	.97	14	.16	26	32
“	28	.23	16	1.52	24	.10	17	.35	......	......
“	29	1.06	18	.23	29	.15	20	.35	......	......
“	......	......	25	1.07	......	......	21	.55	......	......
“	......	......	......	......	......	......	25	.38	......	......
Total rainfall by months	......	3.20	......	5.03	......	3.90	......	4.04	......	3.13
Variation from the normal at station	......	—.93	......	+2.81	......	+1.62	......	+2 02	......	—.39
Benton Ridge	3	.30	3	.22	4	.96	4	1.35	5	.69
“	15	.34	8	2 00	5	.18	11	.36	9	1.00
“	17	.17	16	.75	6	.20	14	.10	10	60
“	19	.11	17	1.08	15	.58	18	.35	13	.10
“	25	27	18	.15	22	.13	21	.36	26	.20
“	28	.20	24	.50	23	.57	22	.34	28	.15
“	29	.51	......	......	24	.18	......	......	......	......
“	30	.22	......	......	......	......	......	......	......	......
“	31	.14	......	......	......	......	......	......	......	......
Total rainfall by months	......	2.34	......	4 73	......	2.75	......	2.89	......	2.83
Variation from the normal at station	......	—1 15	......	+1.21	......	+.67	......	+1.04	......	—.62
Ottawa	15	.79	8	1.39	4	.67	4	1.11	5	.47
“	17	.13	12	.30	5	.12	5	.10	9	.98
“	19	.12	16	.24	6	.19	11	.74	10	63
“	25	.79	17	1.21	14	.10	14	.15	26	.25
“	28	.81	24	.35	15	.11	18	.40	29	.12
“	29	.93	......	......	22	.35	21	.30	......	......
“	30	.25	......	......	24	88	22	.34	......	......
“	......	......	......	......	30	.85	26	.44	......	......
Total rainfall by months	......	3.85	......	3.75	......	3.33	......	3.71	......	2.66
Variation from the normal at station	......	......	......	......	......	......	......	......	......	......
Van Wert	......	......	8	1.00	4	.96	4	.83	5	.44
“	......	......	16	.34	5	.26	22	1 28	9	1.40
“	......	......	17	1.96	6	.54	30	.65	10	.60
“	......	......	29	.24	22	.34	......	......	26	.20
“	......	......	......	......	23	.20	......	......	28	.20
“	......	......	......	......	24	1.68	......	......	......	......
Total rainfall by months	......	......	......	3 61	......	4 04	......	2.76	......	2.84
Variation from the normal at station	......	......	......	+1.23	......	+1.48	......	+1.38	......	—.56
Hedges	8	.11	3	.43	23	1.28	11	.21	5	.11
“	24	21	7	.48	29	.28	14	.19	8	.31
“	27	.23	8	.73	......	......	17	.32	9	.68
“	28	.69	......	......	......	......	18	.19	10	.93
“	30	.93	......	......	......	......	22	.13	25	.10
“	......	......	......	......	......	......	25	.39	26	.30
“	......	......	......	......	......	......	......	......	28	.40
Total rainfall by months	......	2.35	......	1.80	......	1.80	......	1.76	......	2.87
Variation from the normal at station	......	+ 08	......	—.77	......	—.30	......	+.83	......	+.30

MAUMEE RIVER BASIN—Continued.

Station.	July.	Rain.	August.	Rain.	September.	Rain.	October.	Rain.	November.	Rain.
New Bremen	4	.12	1	10	4	.48	......	......	......	......
"	17	.74	3	.60	6	.19	......	......	......	......
"	18	.80	8	1.00	26	.10	......	......	......	......
"	19	36	16	.14	......	......	......	......	......	......
"	25	.87	18	.16	......	......	......	......	......	......
"	28	.23	29	.29	......	......	......	......	......	......
"	30	.31	......	......	......	......	......	......	......	......
Total rainfall by months	......	3.33	......	2 29	......	.83	......	......	......	......
Variation from the normal at station	......	−1.20	......	+.02	......	−1.66	......	......	......	......
Montpelier	17	.96	3	17	1	.11	11	1 40	5	.60
"	18	.73	7	19	5	.59	19	.73	9	.89
"	19	.13	8	.20	6	.79	21	.38	10	.51
"	25	.77	9	.16	15	.47	26	.54	11	.35
"	28	2.15	24	.52	21	1.50	30	.12	26	.25
"	30	.72	26	.14	......	......	......	......	29	.56
Total rainfall by months	......	5.46	......	1.38	......	3.46	......	3.22	......	3.16
Variation from the normal at station	......	+2.05	......	−1.40	......	−.99	......	+1.61	......	—.54
Auburn	18	.43	3	.16	5	.29	1	.21	5	.61
"	20	.17	4	.24	6	1.00	31	3.65	8	.20
"	24	2.05	8	1.25	23	.33	......	......	9	.94
"	25	43	9	.15	25	1.40	......	......	10	.69
"	29	.44	24	.45	29	.18	......	......	23	.13
"	30	1 03	25	.15	......	......	......	......	26	.22
Total rainfall by months	......	4.67	......	2.50	......	3 41	......	3.89	......	3.08
Variation from the normal at station	......	......	......	......	......	......	......	......	......	......
Fort Wayne	17	.45	2	.15	4	.50	1	.15	5	.73
"	18	.40	3	.36	6	1.58	4	.10	8	.29
"	24	.96	8	.99	15	.92	11	2.21	9	1.01
"	25	.36	*	......	17	.19	14	.46	10	.53
"	28	.63	......	......	22	1.15	17	.44	22	.20
"	29	.70	......	......	24	.52	21	.16	26	.30
"	30	.81	......	......	29	.18	22	.12	28	.15
"	......	......	......	......	......	......	25	.45	29	.16
"	......	......	......	......	......	......	30	.15	......	......
Total rainfall by months	......	4.40	......	......	......	5.26	......	4.32	......	3.56
Variation from the normal at station	......	......	......	......	......	......	......	......	......	......
Defiance	19	.87	3	.18	4	.25	1	.11	5	.64
"	20	.24	8	.81	5	.15	4	.59	9	1.54
"	25	.93	9	.21	6	.24	11	1.37	10	.65
"	28	1.21	19	.21	7	1.10	18	.66	26	.20
"	29	1.38	25	.47	15	.58	21	.20	......	......
"	30	1.11	......	......	18	.15	22	.45	......	......
"	......	......	......	......	23	64	25	.15	......	......
"	......	......	......	......	24	.13	26	.26	......	......
"	......	......	......	......	25	.86	30	.12	......	......
"	......	......	......	......	29	.68	31	.20	......	......
Total rainfall by months	......	5.44	......	2 01	......	4.92	......	3.30	......	3.20
Variation from the normal at station	......	+1.51	......	—.37	......	+2.41	......	+1.84	......	—.37

* Not obtainable after the 16th.

MAUMEE RIVER BASIN—Concluded.

Station.	July.	Rain.	August.	Rain.	September.	Rain.	October.	Rain.	November.	Rain.
Ridgeville Corners	18	.15	8	.28	4	.23	4	.24	5	.69
"	19	.41	18	.80	5	.16	11	.90	8	.13
"	20	.16	24	.50	6	.76	18	.56	9	.93
"	25	1.14			15	.40	21	.16	10	.77
"	28	.78			16	.17	22	.45	26	.27
"	29	.13			18	.23	25	.11	29	.15
"	30	.67			22	.21	26	.47		
"					23	.23				
"					24	.77				
"					29	.23				
Total rainfall by months		3.44		1.64		3.39		2.89		2.96
Variation from the normal at station		—.44		--.74		+1 05		+1.63		—.64
Napoleon	19	.20	3	.23	4	.51	4	.65	5	.52
"	25	1.00	8	.81	5	.10	11	.85	9	1.05
"	27	.50	17	.15	6	1.05	18	.53	10	.60
"	28	1.57	18	1.60	14	.67	21	.15	26	.40
"	30	.73	19	.17	22	.23	26	.53		
"			24	.13	23	.60				
"					24	.20				
"					29	.45				
"					30	.15				
Total rainfall by months		4.09		3.09		3.96		2.71		2.65
Variation from the normal at station		+.33		+1.63		+1.55		+.95		—.30
Wauseon	16	.71	3	.80	4	.15	10	.17	5	.58
"	17	.72	7	.24	5	.19	11	1.07	8	.32
"	18	.86	8	.11	6	.62	18	.61	9	1.22
"	19	.10	17	.22	15	.16	21	.19	10	.70
"	25	1.15	18	.32	17	.12	22	.36	26	.18
"	28	.60	24	.46	22	.23	25	.34	28	.10
"	30	67			23	.11	26	.29		
"					24	1.11				
"					29	.40				
Total rainfall by months		4.91		2.24		3.[illegible]2		3.42		3.39
Variation from the normal at station		+1.16		--.49		+.75		+1.05		+.13
Neapolis	16	.34	3	.60	6	1.13	4	.48	5	.54
"	19	.30	7	.20	14	.12	5	.10	8	.80
"	25	1.75	8	.30	18	.35	11	1.10	9	.80
"	28	.67	12	.20	22	.43	18	.58	10	.65
"	30	.70	17	.35	23	.41	21	.25	26	.35
"			18	.15	24	1.10	22	.42		
"			24	.26			26	.46		
"			27	.15						
Total rainfall by months		3.78		2.24		4.27		3.34		2.69
Variation from the normal at station										
Toledo	17	.67	7	.88	4	.30	4	.41	5	.39
"	19	.26	8	.16	5	.12	11	.98	8	.21
"	25	1.18	12	.15	6	.24	18	.32	9	.66
"	28	.70	17	.16	15	.20	21	.24	10	.63
"	30	.40	24	.36	18	.14	22	.41	26	.20
"					23	.40	26	.25		
"					24	.30				
l by months		3.30		1.82		1.81		2.81		2.21
from the normal at station		+.13		--.88		--.56		+.46		--.68
Average for whole basin by months		3.90		2.72		3.36		3.22		2.94
Average variation from the normal for whole basin		+.15		+.20		+.55		+1.28		--.87

The following general statements were also taken from the monthly reports of the United States Weather Bureau, Ohio Section.

July. The temperature was 2.8°F. above the normal, and the precipitation was .40 above the normal. The precipitation in the northern section was .73 above the normal.

August. The temperature was 2.2° F. above the normal. The precipitation was 1.65 above the normal.

September. The temperature was 2 5° F. above the normal. While the precipitation for the State was .04 below the normal, the northern section gave a precipitation of .12 above the normal.

October. The temperature was 2.0°F. above the normal, and the precipitation was 1.68 above. The excess of precipitation for the northern section was 1.99.

November. Temperature, 1.8°F. below the normal. Precipitation, .21 below the normal, although the northern section had a precipitation .11 above the normal.

From these sources we derive the following weather history of the samples. A precipitation of less than one-half inch in twenty-four hours is spoken of as a light rain; from one-half to one inch as moderate, and greater than one inch as heavy.

SANDUSKY RIVER.

July samples. These were taken on the 14th, 15th and 16th of the month, and represent the river after a period of hot, dry weather, as July gave an excess of temperature of nearly 3°F. The samples were taken after a long drouth, as practically no rain had fallen in July previous to the time the samples were taken. The table shows a heavy local rain at Upper Sandusky on July 14, but the rain fell after our samples were taken.

August samples. Taken August 9-11. These again represent excessive hot weather conditions, but differ from the preceding in relation to precipitation influences. On the 3d a moderate rain prevailed over the entire watershed, while the 8th and 9th gave moderate rains at Bucyrus and Vickery, with heavy rains at Upper Sandusky and Tiffin. Little influence would be felt from the rain of the 3d, but the rains preceding the collection by only a day or two would exert considerable influence. Accordingly these samples represent the river directly after moderate to heavy rains, although the weather was fair at the time of sampling.

September samples. The September collections were made on the 19th to 21st of the month and again show fair weather conditions. The lower part of the watershed received a heavy rain on the 4th, and moderate rains on the 6th and 15th, but these would affect the samples only indirectly. At Upper Sandusky there occurred a light rain on the 5th, and moderate rains on the 4th and 17th. The table shows no rain of moment in the upper part on the watershed for nearly four weeks preceding the September sampling, but the collector's note book says: 'Rain fell at Bucyrus September 17 and 18, resulting in roily water."

October samples. These were taken during another fair weather period, as the samples were collected on the 10th, 11th and 12th. The only rain in the month previous to these dates was a heavy one on the 4th and 5th. A moderate rain fell on the 11th, during the time of collection, but would affect only the Tiffin and Fremont samples.

November samples. The November samples were collected on the 9th and 10th. The only rainfall for two weeks previously, as shown by the table, was on the 5th, so we have samples taken after a season of fair weather, but it should be borne in mind that on the two days covering the period of sampling there occurred the heaviest general rain of any forty-eight hours in succession that occurred during the time we had the river under consideration. Two thirds of the rainfall of the entire month fell on these two days, and every sample on the trip was taken in a steady rain. Thus it will be seen that the November samples represent the river at the very beginning of a hard rain, which would bring the stream to flood height. By the time the last stations were reached—Bucyrus, above and below—the stream was overflowing its banks. The results indicate the addition of this amount of rain water, with its attendant surface washings.

MAUMEE RIVER.

July samples. Samples were taken on the 21st–23d of the month. General light or moderate rains had fallen in all parts of the watershed between the 17th and 20th. Previous to these rains there had been a period of drought. No rain fell during the period of sampling. On the 21st the health officer of Findlay informed the collector that on the day preceding, a heavy rain occurred up the river, causing the river to rise eight inches.

August samples. The August samples were collected on the 23d, 24th and 25th The samples from Ft. Wayne and from Defiance above on the Maumee represent the condition of the water in summer after a long drought, as no rain of moment had fallen on that part of the watershed for sometime There were, however, one week previous to the time of sampling, heavy rains on the area drained by the Blanchard and Ottawa rivers, with a heavy rain at Napoleon and a light one at Toledo. On the 24th and 25th occurred moderate or heavy rains to affect the following samples: Defiance, Napoleon, and Toledo slightly, while a heavy rain of 1.07 inches fell within the twenty-four hours preceding the taking of the Findlay samples.

September samples. The date of the September sampling was from the 26th to 28th. This was a period of fair weather. The month in general had been wet and culminated in a severe rain on or about the 24th. In some localities a severe wind accompanied this storm, as at Lima. Accordingly these samples represent wet weather conditions followed by a few days of fair weather.

October samples. In October the samples were taken on the 24th, 25th and 26th, representing the river after considerable wet weather. The streams were higher than in September, but had not risen so suddenly, nor were the waters so high as in the succeeding month.

November samples. The November samples showed the river in by far the highest stage examined. The samples were taken on the 14th to the 16th. Although the precipitation for Ohio for November was .21 inch below the normal, yet the northern section gave an excess of .11 inch, and furthermore, nearly all the rainfall of the month occurred between the 5th and 11th. The weather was cold, especially so during the time of sampling. This high stage of the river continued for some days, and gave results not obtainable in the warmer season of the year, and the dryer months.

LIST OF SAMPLES.

Following is a list of samples taken, with the serial number, location, source, date and hour of collection :

1	Upper Sandusky,	below,	Sandusky	river,	July	14,	8:15 A. M.
2	"	above	"	"	"		9:15 A. M.
3	Bucyrus,	"	"	"	"		2:15 P. M.
4	"	below	"	"	"		3:15 P. M.
5	Crestline, 2 miles	"	"	"	"		6:00 P. M.
6	" 3 "	"	"	"	"		7:00 P. M.
7	Tiffin,	above	"	"	July	15,	8:30 A. M.
8	"	below	"	"	"		10:00 A. M.
9	Fremont,	above	"	"	"		6:00 P. M.
10	"	below	"	"	"		6:45 P. M.
11	Sandusky,	intake,	Sandusky	bay,	July	16,	9:15 A. M.
12	Findlay,	above,	Blanchard	river,	"	21,	10:00 A. M.
13	"	below	"	"	"	21,	10:45 A. M.
14	Lima,	above,	Ottawa	river,	"	21,	3:15 P. M.
15	"	below	"	"	"	21,	4:30 P. M.
16	Ft. Wayne,	"	Maumee	river,	July	22,	9:00 A. M.
17	"	above,	St. Marys	"	"	22,	10:30 A. M.
18	Defiance,	"	Maumee	"	"	22,	1:30 P. M.
19	"	"	Auglaize	"	"	22,	2:45 P. M.

20	Defiance,	below,	Maumee	river,	July	22,	4:00 P. M.
21	Napoleon,	above	“	“	“	23,	6:45 A. M.
22	“	below	“	“	“	23,	8:00 A. M.
23	Toledo,	above	“	“	“	23,	2:30 P. M.
24	“	Cherry street,	“	“	“	23,	3:45 P. M.
25	“	Riverside Park,	“	“	“	23,	4:15 P. M.
26	Upper Sandusky,	below,	Sandusky	“	Aug.	9,	8:15 A. M.
27	“ “	above	“	“	“	9,	9:15 A. M.
28	Bucyrus,	“	“	“	“	9,	1:45 P. M.
29	“	below	“	“	“	9,	2:45 P M.
30	Crestline,	“	“	“	“	9,	6:00 P. M.
31	Tiffin,	above	“	“	“	10,	8:30 A. M.
32	“	below	“	“	“	10,	10:00 A. M.
33	Fremont,	“	“	“	“	10,	4:30 P. M.
34	“	above	“	“	“	10,	5:30 P. M.
35	Sandusky,	intake	“	bay,	“	11,	9:15 A. M.
36	Ft. Wayne,	below,	Maumee	river,	“	23,	5:00 P M.
37	“	above,	St. Joseph	“	“	23,	6:00 P. M.
38	“	“	St. Mary	“	“	23,	7:00 P. M.
39	Lima,	below,	Ottawa	“	“	24,	9:00 A. M.
40	“	above	“	“	“	24,	11:00 A. M.
41	Defiance,	“	Maumee	“	“	24,	3:45 P. M.
42	“	“	Auglaize	“	“	24,	4:30 P. M.
43	“	below,	Maumee	“	“	24,	5:30 P. M.
44	Napoleon,	above	“	“	“	25,	6:15 A. M.
45	“	below	“	“	“	25,	7:15 A. M.
46	Toledo, Riverside Park,		“	“	“	25,	10:00 A. M.
47	“	Cherry street,	“	“	“	25,	10:30 A. M.
48	“	above	“	“	“	25,	12:00 M.
49	Findlay,	below,	Blanchard	“	“	25,	4:15 P. M
50	“	above	“	“	“	25,	5:15 P. M.
51	Upper Sandusky,	below,	Sandusky	“	Sept.	19,	8:00 A. M.
52	“ “	above	“	“	“	19,	9:00 A. M.
53	Crestline,	below	“	“	“	19,	11:30 A. M.
54	Bucyrus,	“	“	“	“	19,	2:00 P. M.
55	Bucyrus,	above	“	“	“	19,	3:00 P. M.
56	Tiffin	“	“	“	“	20,	1:30 P. M.
57	“	below	“	“	“	20,	2:00 P. M.
58	Fremont,	“	“	“	“	20,	4:30 P. M.
59	“	above	“	“	“	20,	5:30 P. M.
60	Sandusky,	intake	“	bay,	“	21,	8:30 A. M.
61	Findlay,	below,	Blanchard	river,	“	26,	9:30 A. M.
62	“	above	“	“	“	26,	10:30 A. M.
63	Lima,	below,	Ottawa	“	“	26,	5:00 P. M.
64	“	above	“	“	“	26,	6:00 P M.
65	Ft. Wayne,	below,	Maumee	“	“	27,	8:30 A. M.
66	“	above,	St. Joseph	“	“	27,	9:30 A. M
67	“	“	St. Mary	“	“	27,	10:30 A M.

68	Defiance,	above,	Maumee	river,	Sept.	27,	1:15 P. M.
69	"	"	Auglaize	"	"	27,	2.00 P. M.
70	"	below,	Maumee	"	"	27,	3:00 P. M.
71	Napoleon,	above	"	"	"	28,	7:00 A. M.
72	"	below	"	"	"	28,	8:00 A. M.
73	Toledo, Cherry street,		"	"	"	28,	1:15 P. M.
74	" Riverside Park,		"	"	"	28,	2:00 P. M.
75	"	above	"	"	"	28,	3:00 P. M.
76	Upper Sandusky,	below,	Sandusky	"	Oct.	10,	7:45 A. M.
77	" "	above	"	"	"	10,	8:45 A. M.
78	Bucyrus,	"	"	"	"	10,	10:30 A. M.
79	"	below	"	"	"	10,	11:30 A. M.
80	Crestline,	"	"	"	"	10,	2:15 P. M.
81	"	above	"	"	"	10,	3:15 P M.
82	Tiffin,	below	"	"	"	11,	3:00 P. M.
83	"	above	"	"	"	11,	4:00 P. M.
84	Sandusky,	intake,	Sandusky bay,		"	12,	9:30 A. M.
85	Fremont,	below	"	river,	"	12,	1:00 P. M.
86	"	above	"	"	"	12,	2:00 P. M.
87	Findlay,	below,	Blanchard	"	"	24,	9:30 A. M.
88	"	above	"	"	"	24,	10:30 A. M.
89	Lima,	below,	Ottawa	"	"	24,	4:30 P M.
90	"	above	"	"	"	24,	5:15 P. M.
91	Ft. Wayne,	below,	Maumee	"	"	25,	8:30 A. M.
92	"	above,	St. Joseph	"	"	25,	9:30 A. M.
93	"	"	St Mary	"	"	25,	10:30 A. M.
94	Defiance,	"	Maumee	"	"	25,	2:00 P. M.
95	"	"	Auglaize	"	"	25,	2:30 P. M.
96	"	below,	Maumee	"	"	25,	3:15 P. M.
97	Napoleon,	above	"	"	"	26,	6:30 A. M.
98	"	below	"	"	"	26,	7:15 A. M.
99	Toledo, Cherry street,		"	"	"	26,	11:00 A. M.
100	"	above	"	"	"	26,	1:00 P. M.
101	" Riverside Park,		"	"	"	26,	3:00 P. M.
102	Upper Sandusky,	below,	Sandusky	"	Nov.	9,	7:45 A. M.
103	" "	above	"	"	"	9,	8:30 A. M.
104	Crestline,	below	"	"	"	9,	10:30 A. M.
105	"	above	"	"	"	9,	11:30 A. M.
106	Tiffin,	below	"	"	"	9,	2:30 P. M.
107	"	above	"	"	"	9,	3:30 P M.
108	Fremont,	"	"	"	"	10,	5:45 A. M.
109	"	below	"	"	"	10,	6:30 A. M.
110	Sandusky,	intake,	Sandusky bay,		"	10,	9:15 A. M.
111	Bucyrus,	above	"	river,	"	10,	1:30 P. M.
112	"	below	"	"	"	10,	2:30 P. M.
113	Findlay,	"	Blanchard	"	"	14,	9:30 A. M.
114	"	above	"	"	"	14,	10:30 A. M.
115	Toledo, Riverside Park,		Maumee	"	"	14,	3:00 P. M.

116	Toledo, Cherry street,		Maumee	river,	Nov.	14,	4:00 P. M.
117	“	above	“	“	“	14,	5:00 P. M.
118	Napoleon,	“	“	“	“	15,	5:30 A. M.
119	“	below	“	“	“	15,	6:00 A. M.
120	Defiance,	above,	Auglaize	“	“	15,	3:00 P. M.
121	“	below,	Maumee	“	“	15,	3:30 P. M.
122	“	above	“	“	“	15,	4:30 P M.
123	Ft Wayne,	“	St. Joseph	“	“	16,	6:00 A. M.
124	“	below,	Maumee	“	“	16,	7:00 A. M.
125	“	above,	St. Mary	“	“	16,	8:00 A. M.
126	Lima,	below,	Ottawa	“	“	16,	1:00 P. M.
127	“	above	“	“	“	16,	2:00 P. M.

It will be seen that samples 11, 35, 60, 84 and 110 are from Sandusky bay at the intake, where the public supply is obtained for Sandusky. The stations above Bucyrus, Upper Sandusky, Findlay, Defiance, Napoleon, Toledo, and at Sandusky, were at or near the intake, and the results indicate the quality of the water supply at those places. The same is true of Tiffin, Fremont and Lima, with the exception that a part of their supplies is obtained from ground sources. The July sample below Upper Sandusky was, through a misunderstanding, taken above part of the local pollution. The later samples were taken about half a mile lower down the stream. The samples of the later four months below Defiance, and above Napoleon, were taken from the opposite bank of the river than were the July samples, owing to the difficulty in reaching the points where the first samples were taken. The July, Toledo, Cherry street sample, was taken from a dock, but the later samples were taken from the channel of the stream by means of a row boat.

RESULTS OF THE ANALYSES.

The results of the analyses of samples from the Sandusky and Maumee watersheds for the five months, July to November, 1898, are given, first in tabulated form, and second by curves. In the table, the first column gives the station numbers. These commence at the headwaters and are arranged geographically along the course of the river to its mouth. In each case the station number, unaccompanied by a subscript letter represents the station above the local pollution, while the number with a subscript letter shows a station below local pollution. When more than one station occurs below local pollution (e. g. Toledo) the subscript letters show alphabetically the relative location of the station, “a” being nearer the headwaters of the stream than “b”. Where two stations occur at any city above the local pollution, they are situated on different streams and are distinguished by subscript numerals. The second column gives the serial number of the sample as collected. The third column gives in miles the approximate distance by river from the uppermost station taken. The fourth and fifth columns give respectively the locality and the date of sampling. Then follow the analytical results, the figures representing parts per million (milligrams per litre), except in the case of color, dissolved oxygen, bacteria and temperature, as explained previously. In plotting the curves, horizontal spaces represent distances by river, while vertical spaces represent the amounts present of the substance in question. Naturally, the vertical scale varies according to the substance plotted. The samples were collected as nearly once a month as other laboratory work would permit.

SANDUSKY WATERSHED.

SANDUSKY RIVER.

(Parts per million.)

Station	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
1	81	....	Crestline, above town	Oct.	10	.25	Dis.	V. S.	None	6.60
	105		" "	Nov.	9	.40	Dec.	C.	Woody	8.74
			Average	....	.....	.32	....	....	....	7.67
	5	2	Crestline, below town.........	July	14	1.00	Dis.	C.	Foul	11.45
	30		" "	Aug.	9	.40	Dis.	C.	Foul	10.84
	53		" "	Sept.	19	.60	Dec.	C.	Very musty......	7.38
	80		" "	Oct	10	.30	Dis.	C.	Foul	11.95
	104		" "	Nov.	9	.60	Dec.	C.	Foul, earthy.....	11.17
			Average	....	.....	.68	....	....	....	10.56
1b	6	3	Crestline, below town.........	July	14	.10		S.	Slight musty.....	4.55
2	3	17	Bucyrus, above town...........	July	14	.10	S.	S.	None	4.45
	28		" "	Aug.	9	.3	Dis	S.	Faint musty.....	6.45
	55		" "	Sept.	19	.25	S.	S.	None	5.98
	78		" "	Oct.	10	.42	Dis.	S.	Faint musty.....	7.96
	111		" "	Nov.	10	.5	Dec.	C.	Earthy	9.54
			Aver	....	.....	.31	....	....	....	6.88
	4	20	Bucyrus, below town..........	July	14	2.00	Dec.	M.	Very foul.........	8.27
	29		" "	Aug.	9	.3	Dis.	S.	Very offensive..	6.41
	54		" "	Sept.	19	.3	S.	C.	Sour..................	7.39
	79		" "	Oct.	10	.45	Dis	S.	Musty	9.01
	112		" "	Nov.	10	.5	Dec.	C.	Earthy	7.67
			Average	....	.....	.71	....	....	....	7.75
3	2	42	Upper Sandusky, above......	July	14	.0	S.	S.	Woody	3.77
	27		" "	Aug.	9	.15	S.	S.	Woody	5.93
	52		" " ...	Sept.	19	.25	V. S.	S.	None	6.11
	77		" "	Oct.	10	.4	Dis.	S.	Woody	8.18
	103		" "	Nov.	9	.45	Dec.	C.	Earthy	7.56
			Average	....	....	26	....	....	....	6.31
	1*	44	Upper Sandusky, below......	July	14	.1	S.	S.	Musty	4.02
	26		" "	Aug.	9	.18	S.	S.	Offensive..........	6 02
	51		" " ...	Sept.	19	.35	V. S.	S.	Musty	6.98
	76		" "	Oct.	10	.4	Dis.	S.	Musty	7.36
	102		" "	Nov.	9	.45	Dec.	C.	Earthy	8.40
			Average	....	...	.30	..... .	....	....	6.56
4	7	74	Tiffin, above town..............	July	15	.1	S.	S.	Peculiar...........	4.35
	31		" "	Aug	10	55	Dec.	S.	Woody	10.39
	56		" "	Sept.	20	.35	V. S.	S.	Woody	8.28
	83		" "	Oct.	11	.25	Dis.	S.	Woody	5.43
	107		" "	Nov	9	.5	Dec.	C.	Earthy	7.40
			Average	....	.....	35	....	....	....	7.16

* Sample No. 1 was not taken below all local sewage pollution.

SANDUSKY WATERSHED.

Sandusky River.

(Parts per million.)

	Nitrogen as										
Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.198	0.032	.003	0.192	8.6	183 1	46.4	478	122	123.0	1,160	21.5
0.688	0.048	Trace.	0.331	1.2	39.0	11.4	332	65	77.5	58,500	8.
0.443	**0.040**	**.002**	**0.262**	**4.9**	**111.0**	**28.9**	**405**	**94**	**100.0**	**29,830**	....
0.454	0.530	.400	7.944	198.8	308.4	7.7	877	126	83.0	65,350	28.
0.516	0.780	.250	0.226	63.5	225.4	128.2	748	141	26.5	30,210	23.
0.440	0.680	.250	6.220	24.3	152.2	93.5	623	162	62.9	46,800	20.5
0.456	0.896	.050	3.036	83 1	327.8	35.6	675	143	43.5	18,095	20.
0.812	0.152	.025	0.461	7.4	63.9	27.4	625	117	40.0	222,300	8.
0.536	**0.608**	**.195**	**3.577**	**75.4**	**215.5**	**58.5**	**710**	**138**	**51.2**	**76,551**	....
0.219	0.094	.001	0.318	12.7	146.4	51.7	467	92	Not tak'n	Not tak'n	Not tak'n
0.190	0.083	Trace.	0 262	11.8	172.4	10.4	402	74	124.0	345	30 5
0.240	0.032	.018	0 064	17,7	113 8	82.0	372	80	114.5	775	25.
0.212	0 064	.005	0.232	16.2	150.9	42 4	884	96	109.3	735	25.
0.226	0.038	.008	0 180	12.0	172.1	28 4	326	85	87.4	200	16.5
0.476	0.039	Trace.	0.418	3.7	60.0	None.	491	68	81.7	82,800	8.
0.229	**0.051**	**.006**	**0.231**	**12.3**	**133.8**	**32.6**	**395**	**81**	**103.4**	**16,971**	....
0 636	0 784	.023	2.748	63.2	171.6	160.0	580	155	67.0	295,800	30.
0.420	0.460	.087	0.166	24.2	137.4	53.4	373	82	72.3	29,260	25.5
0.272	0.144	018	0.296	14.2	169.0	35.3	379	63	94 0	24,070	24.
0.404	0 548	.015	1 328	16.4	176.6	42.6	568	169	79 4	5 381	18.
0 552	0.042	004	0.331	4 5	55.5	None.	348	51	62.8	175 000	8.
0.457	**0.396**	**.029**	**0.974**	**24.5**	**142.0**	**58.3**	**450**	**104**	**75.1**	**105,902**	....
0.192	0.082	.003	0.280	11.5	133.4	124.2	528	133	79.0	167	25.
0.272	0.064	.003	0 054	24.6	144 4	83.6	419	115	83 3	677	23.
0.176	0.050	.004	0.224	4.0	138.2	71.8	429	8	86.5	1,300	20.5
0.192	0.046	.002	0.080	16.6	158.6	64.4	367	107	94.3	585	15,5
0.560	0.076	.005	0.288	6.7	121,1	38.4	321	115	86.3	13,100	7.5
0.278	**0.064**	**.003**	**0.185**	**12.7**	**139.1**	**76.5**	**413**	**110**	**85.9**	**3,166**	....
0.194	0.104	.009	0.318	13.8	155.2	134.7	777	353	47 0	610	24.
0.302	0.112	.025	0.152	28 4	147.6	88.8	501	131	61.7	8,440	22 8
0.312	0.132	040	0.248	10.0	151.8	99.5	482	56	54.6	40,320	19.
0.248	0.080	.010	0 244	12 8	174.7	55.4	423	87	76.0	5,070	14 5
0.592	0.104	.006	0.274	7.1	113.5	35 0	310	51	77.7	31,900	7.5
0.330	**0.106**	**.018**	**0.247**	**14.4**	**148.6**	**82.7**	**499**	**136**	**63 4**	**17.268**	....
0.190	0.144	.002	0.248	103.5	170.4	96.3	712	232	95.0	133	27.
0.280	0.058	.008	0.060	15.2	71.6	56.4	340	75	59.1	1,590	23
0 148	0 042	.010	0.192	32.8	160.6	86.8	495	94	115.5	820	22.5
0.234	0 034	.001	0.152	150.1	186.6	76 2	734	160	80.9	1,155	18.
0 592	0.116	Trace	0.233	20.3	126.8	24.0	461	57	79.7	16,980	7.
0.289	**0.079**	**.004**	**0.177**	**64.4**	**143.2**	**67.9**	**548**	**124**	**86.0**	**4,134**	....

SANDUSKY WATERSHED—Concluded.

Sandusky River—Concluded.

(Parts per million.)

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
4a	8	77	Tiffin, below town	July	15	.2	S.	S.	Bad, musty	4 35
	32		“ “	Aug.	10	.65	Dec.	S.	Sour	10.67
	57		“ “	Sept.	20	.35	V. S.	S.	Sweetish	8.81
	82		“ “	Oct.	11	.3	Dis.	S.	Musty	5.12
	106		“ “	Nov.	9	.5	Dec.	C.	Earthy	8.79
			Average			.4				7.55
5	9	96	Fremont, above town	July	15	.15	S.	S.	None	4.27
	34		“ “	Aug.	10	.55	Dis	S.	Slight musty	7.17
	59		“ “	Sept.	20	.4	S.	S.	Slight musty	9.30
	86		“ “	Oct.	12	.28	S.	S.	Slight musty	5.22
	108		“ “	Nov.	11	.47	Dec.	C.	Earthy	9.31
			Average			.37				7.05
5a	10	98	Fremont, below town	July	15	.2	S.	S.	Faint musty	4.55
	33		“ “	Aug.	10	.55	Dis.	S.	Musty	8.01
	58		“ “	Sept.	20	.4	V. S	V. S.	Faint musty	9.07
	85		“ “	Oct.	12	.3	Dis.	S.	Faint musty	6.46
	109		“ “	Nov.	11	.47	Dec.	C.	Earthy	7.91
			Average			.38				7.20
6	11	125	Sandusky, crib	July	16	.05	V. S	V. S	Woody	2.32
	35		“ “	Aug.	11	.1	S.	V. S	None	2.64
	60		“ “	Sept.	21	.1	None	Trace	None	2.77
	84		“ “	Oct.	12	.1	S.	S.	None	3.93
	110		“ “	Nov.	10	.05	V. S.	S.	None	2.02
			Average			.08				2 74

SANDUSKY WATERSHED—Concluded.

SANDUSKY RIVER—Concluded.

(Parts per million.)

Nitrogen as				Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.								
0.248	0.128	.007	0.371	99.8	173.2	99.2	677	215	92.0	5,700	28.
0.428	0.084	.015	0.112	21.3	80.8	106.8	331	69	77.7	9,723	28.
0.336	0.280	.025	0.140	38.3	159.8	91.8	451	46	112.3	4,140	24.
0.352	0.108	.013	0.244	147.5	183.5	85.2	657	183	82.1	37,400	19.
0.656	0.128	.004	0.227	10.5	143.6	27.6	437	88	73.1	53,000	7.5
0.404	**0.146**	**.013**	**0.219**	**63.5**	**148.2**	**82.1**	**613**	**120**	**87.4**	**21,992**	....
0.234	0.062	None.	0.200	99.2	125.0	20.2	595	186	94.0	330	29.5
0.358	0.078	.013	0.058	53.6	92.0	41.6	493	137	89.2	1,319	25.2
0.226	0.044	.003	0.160	33.1	126.4	61.2	468	75	86.8	675	21.5
0.172	0.022	.010	0.367	60.1	191.1	69.2	479	94	88.4	1,455	17.
0.664	0.080	Trace.	0.252	15.4	134.6	36.4	601	124	84.7	4,490	7.5
0.331	**0.057**	**.005**	**0.207**	**52.3**	**133.8**	**45.7**	**527**	**123**	**88.6**	**1,654**	....
0.284	0.089	Trace.	0.364	102.5	133.2	26.1	577	186	98.0	4.725	29.
0.412	0.082	.016	0.062	61.0	100.2	112.2	410	91	74.3	11,060	25.7
0.284	0.144	.010	0.168	37.5	125.2	76.9	414	84	78.2	4,730	22.
0.356	0.116	.025	0.447	64.5	191.5	55.4	368	110	78.0	11,400	17.
0.596	0.120	.006	0.220	22.1	148.0	35.0	522	109	77.5	5,060	7.5
0.386	**0.110**	**.011**	**0.252**	**57.5**	**139.6**	**61.1**	**458**	**116**	**81.2**	**7,395**	....
0.131	0.042	.003	0.102	10.8	89.8	47.5	232	80	96.0	323	26.
0.160	0.041	.013	0.068	13.6	95.4	45.8	265	74	91.3	594	24.5
0.160	0.022	None.	0.040	8.9	100.6	36.2	221	35	89.9	115	19.
0.120	0.016	None.	0.049	11.2	105.8	36.6	264	47	78.6	1,680	16.
0.324	0.024	None.	0.126	4.7	106.8	36.0	206	21	79.9	359	8.
0.179	**0.030**	**.003**	**0.077**	**9.8**	**99.7**	**40.4**	**238**	**61**	**87.1**	**614**	....

MAUMEE WATERSHED.

BLANCHARD RIVER.

(Parts per million.)

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
1	12	....	Finday, above town.....	July	21	.2	S.	S.	None..................	4.30
	50		" "	Aug.	25	.28	None	S.	Musty..............	7.69
	62		" "	Sept.	26	.5	Dec.	S.	Peculiar, bad...	8.73
	88		" "	Oct.	24	.45	S.	V. S.	V. disagreeable.	9.34
	114		" "	Nov.	14	.32	Dec.	C.	Peculiar..........	11.19
			Average......................	....	....	.35	....	....	....	8.25
1a	13	3	Findlay, below town ...	July	21	1.00	S.	S.	Bad, oily..........	6.40
	49		" " ...	Aug.	25	.2	None	C.	Musty...............	4.80
	61		" " ...	Sept	26	.45	Dec.	S.	Peculiar, bad...	7.19
	87		" " ...	Oct.	24	.3	Dis.	S.	Foul..................	4.63
	113		" " ...	Nov.	14	.3	Dec.	C.	Peculiar............	11.54
			Average......................	....	....	.45	....	....	....	6.91

OTTAWA RIVER.

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
2	14	....	Lima, above town.......	July	21	.1	V. S.	V. S.	Slight musty.....	4.70
	40		" "	Aug.	24	.15	None	V. S.	Slight musty.....	3.51
	64		" "	Sept.	26	.45	Dec.	S.	None.................	11.77
	90		" "	Oct.	24	.45	S.	V. S.	None.................	7.85
	127		" "	Nov.	16	32	Dis.	C.	Faint oily.........	6.59
			Average......................	....	....	.29	....	....	....	6.78
2a	15	4	Lima, below town.......	July	21	3.50	Dec.	M.	Foul, oily.........	65.37
	39		" "	Aug.	24	4.00	Dec.	M.	Foul..................	110.47
	63		" "	Sept.	26	.8	Dec	M.	Foul..................	42.72
	89		" "	Oct.	24	......	†	....	....	....
	126		" "	Nov.	16	.32	Dis.	C.	Oily..................	9.58
			Average......................	....	....	2.15	....	....	....	57.04

AUGLAIZE RIVER.

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
4	19	*69	Defiance, above town...	July	22	.2	Dis.	S.	None..................	5.25
	42	‡59	" " ...	Aug.	23	.35	S.	S.	Faint musty.....	6.40
	69		" " ...	Sept.	27	.5	Dec.	S.	Woody..............	14.20
	95		" " ...	Oct.	25	.4	Dis.	S.	Musty................	9.01
	120		" " ...	Nov.	15	.28	Dec.	C.	Earthy..............	9.97
			Average......................	....	....	.35	....	....	....	8.97

ST. MARY RIVER.

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
8	17	....	Ft. Wayne, above town	July	22	1	None	V. S.	None..................	4.34
	38		" "	Aug.	23	.25	None	None	None..................	4.60
	67		" "	Sept.	27	4	Dis.	S.	None..................	10.12
	93		" "	Oct.	25	.4	Dis.	V. S.	Earthy..............	6.83
	125		" "	Nov.	16	.26	Dec.	C.	Woody..............	15.04
			Average......................	....	....	.28	....	....	....	8.19

*From Station 1. ‡From Station 2. † Sample lost by breaking of bottle during transportation.

MAUMEE WATERSHED.

BLANCHARD RIVER.

(Parts per million.)

Nitrogen as				Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.								
0.198	0.033	.008	0.382	19.5	130.2	154 6	678	156	79.0	292	28.
0.281	0.332	.035	18 400	165.5	* 50 6	162.1	1,222	315	59 0	1,110	26.
0.338	0.294	.200	6 330	449.5	67 9	125.2	1 258	380	61.4	930	20.5
0.258	0 136	.018	8.280	144.5	138 0	98 6	725	203	78.8	1,436	8.5
0 408	0.080	.020	14.135	44.9	128.6	72 0	529	257	80.4	1,285	6.
0.297	**0.175**	**.056**	**9.505**	**164.8**	**82.8**	**122.5**	**882**	**262**	**71.7**	**1,011**	....
0.630	0.182	†	0 327	107 7	133.4	147.2	830	263	159.0	7,790	28.
0.292	0.344	.060	15 500	127.3	* 44 0	156.4	962	153	56.2	3,370	27 5
0 412	0.564	.238	3.853	350.9	70.1	111.4	1,302	394	53.8	34,960	20.5
0.300	0 406	.090	9.200	266 0	91.4	125 6	1,073	36[illegible]	73.2	13,050	11.
0 468	0.100	.021	13 042	31.0	128.8	58 6	536	235	69 6	1.900	6.
0.420	**0 319**	**.102**	**8.384**	**177.2**	**94.9**	**119.8**	**941**	**281**	**82.4**	**12,214**	....

OTTAWA RIVER.

Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.154	0.027	None.	0 318	29.6	187 2	158.0	642	170	102.0	497	29.
0.199	0 055	None.	0.220	24.3	173.8	74.6	590	77	88.3	895	28.
0 250	0.051	.005	0. 36	119.8	151 6	78.2	828	232	58.7	3,450	22.
0.193	0 018	.010	0.348	22.1	172.2	30 4	392	141	99.8	2.910	11.5
0 240	0 056	.010	10.434	17.1	137.8	57.6	373	132	87.9	1,130	5.
0.208	**0 042**	**.005**	**2.291**	**42 6**	**164.5**	**79.8**	**565**	**150**	**87.3**	**1,776**	....
1.068	0.084	†	0.552	183.2	227.6	171.4	1,265	462	0.0	371 300	31 2
1 072	0.600		2.490	195.7	383 0	94.4	1,121	523	0.0	227,800	25.5
0.844	0.161		0.557	300.2	237 6	61.3	1,224	373	27 5	94,620	22.5
....	....	....	....	....	....	....	....	....	68.6	76,[illegible]60	11.5
0.480	0.295	.042	10.013	35.0	140.0	57.4	457	168	82.7	15 760	5.
0.866	**0 285**	**.042**	**3 403**	**178.8**	**247 0**	**96 1**	**1.017**	**382**	**35.6**	**157.248**	....

AUGLAIZE RIVER.

Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.281	0.035	None.	0.276	166 6	142 8	86.4	455	116	104.0	615	30.
0.256	0.101	.025	1.660	95 0	126.0	37.0	580	141	107.7	485	28.
0.308	0.060	.008	2.621	117.1	128 9	72.4	870	234	64 6	3,500	21.
0.256	0 028	Trace	0 436	71 4	158 2	61 6	602	174	85 0	6,070	11.
0.372	0.116	.008	9.001	27.8	139.0	43 4	355	132	88 6	10,0[illegible]0	5.5
0.295	**0 068**	**008**	**2 798**	**83 6**	**139 0**	**60 2**	**578**	**159**	**90.0**	**4,150**	....

ST. MARY RIVER.

Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.241	0.029	None.	0.444	34.5	160.2	100.8	835	269	85.0	665	27.5
0 216	0.075	None.	0.072	104 5	141.2	68 8	716	145	98.2	1,550	29.
0 308	0 134	.005	0.093	76 6	155 9	44.4	589	159	79.5	1,550	21.
0.276	0.038	.004	0.180	96.4	148 2	94.6	580	160	90 9	1,317	11.
0.432	0.044	.008	9 473	34 5	109 6	29 4	420	147	81.4	7,360	3.5
0 295	**0.064**	**.003**	**2 052**	**69.3**	**143.0**	**67 6**	**628**	**176**	**87 0**	**2,488**	....

* Acid. † Reaction interfered with.

MAUMEE WATERSHED—Continued.

ST. JOSEPH RIVER.

(Parts per million.)

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected. Month.	Day.	Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
3_2	37	....	Ft. Wayne, above town	Aug.	23	.25	V. S.	V. S	None	4.95
	66		" "	Sept.	27	.25	V. S.	V. S.	None..	3.74
	92		" "	Oct.	25	.55	Dis.	S.	Woody	14.69
	123		" "	Nov.	16	.4	Dec.	C.	Woody	18.20
			Average	....	....	.36	....	....	....	10.40

MAUMEE RIVER.

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected. Month.	Day.	Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
3a	16	From 3_1 5.5	Ft. Wayne, below town	July	22	2	S.	S.	Foul	5.07
	35		" "	Aug.	23	.3	S.	S.	Sewage............	5 32
	65	From 3_2 3.5	" "	Sept.	27	.4	S.	C.	Sewage..	6.35
	91		" "	Oct.	25	.6	Dis.	S.	Faint sour............	14.48
	124	....	" "	Nov.	16	.38	Dec.	C.	Peculiar earthy	15.78
		....	Average	....	....	.38	....	....	....	9.40
4_2	18	60	Defiance, above town...	July	22	.1	V. S.	V. S	None............	4.30
	41		" " ...	Aug.	24	.25	V. S	V. S.	None............	5 45
	68		" " ...	Sept.	27	.4	S.	S.	None............	7.42
	94		" " ...	Oct.	25	.42	V. S.	S.	Faint woody.....	13.50
	122		" " ...	Nov.	15	.35	Dec.	C.	Earthy	16.17
			Average	....	....	.3	....	....	....	9.37
4a	20	3_1-62	Defiance, below town...	July	22	.2	Dis.	S.	Faint offensive.	5.30
	43	1-70	" " ...	Aug.	24	.35	S.	S.	Slight musty.....	7.27
	70	2-60	" " ...	Sept.	27	.5	S.	S.	Musty	7.33
	96		" " ...	Oct.	25	.4	S.	S.	Earthy............	13.05
	121		" " ...	Nov.	15	.32	Dec.	C.	Earthy............	11.26
			Average	....	....	.35	....	....	....	8.84
5	21	3_1-78	Napoleon, above town	July	23	.2	Dis.	V. S.	None	5.38
	44	1-86	" "	Aug	25	.3	S.	V. S.	None.	5.56
	71	2-76	" "	Sept.	28	.35	S.	S.	None	6.11
	97		" "	Oct.	26	.4	Dis.	S.	Earthy	12 66
	118		" "	Nov.	15	.32	Dec.	C.	Earthy	18.61
			Average	....	....	.31	....	....	....	9.66
5a	22	3_1-80	Napoleon, below town	July	23	.2	Dis.	S.	Slight sour........	5 85
	45	1-88	" "	Aug.	25	.33	S.	V. S.	None..	6.58
	72	2-78	" "	Sept.	28	.35	S.	S.	Faint musty.....	6.12
	98		" "	Oct.	26	.4	Dis.	S.	Faint musty.....	13.94
	119		" "	Nov.	15	.32	Dec.	C.	Earthy	14.89
			Average	....	....	.32	....	....	....	9.48
6	23	3_1-116	Toledo, above town......	July	23	.1	Dis.	S.	None............	5.92
	48	1-124	" "	Aug.	25	.25	V. S.	V. S.	None............	6.75
	75	2-114	" "	Sept.	27	.4	V. S.	S.	None	7.23
	100		" "	Oct.	26	.42	Dis.	S.	Faint musty.....	9.46
	117		" "	Nov.	14	.3	Dec.	C.	Earthy	15.08
			Average	....	....	.29	....	....	....	8.69

MAUMEE WATERSHED—Continued.

St. Joseph River.

(Parts per million.)

Nitrogen as											
Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.186	0.070	None.	0.116	4.7	219.0	10.4	362	19	99.5	1,260	27.
0.182	0.056	None	0.078	2.2	232.2	0.	335	85	94.9	1,400	22.
0.410	0.046	.008	0.261	5.0	172.0	67.8	433	127	81.9	813	10.
0.332	0.028	.005	7.611	2.5	122.2	31.0	375	153	86.9	5,860	3.
0.278	**0.050**	**.003**	**2.017**	**3.6**	**186.4**	**27.3**	**376**	**96**	**90.8**	**2.333**	....

Maumee River.

Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.271	0.262	.015	0.333	139.0	229.0	101.2	507	132	36.0	145,400	27.
0.356	0.596	.032	0.164	45.2	191.8	41.8	475	81	40.9	39,040	28.5
0.376	0.248	.018	0.371	20.9	219.0	38.8	421	111	54.3	37,510	19.
0.512	0.168	.020	0.420	31.8	170.2	55.0	470	144	66.1	7,040	10.
0.448	0.060	.010	8.750	15.5	123.2	22.4	373	171	75.8	20,280	3.5
0.393	**0.267**	**.019**	**2.008**	**50.5**	**186.6**	**51.8**	**449**	**128**	**54.6**	**49,814**	....
0.185	0.053	None.	0.414	21.5	157.2	69.0	415	140	102.0	329	29.5
0.306	0.042	None.	0.188	14.9	144.6	4.2	364	51	91.8	838	29.5
0.260	0.044	.008	0.179	17.7	174.3	12.1	441	136	83.0	1,310	21.
0.418	0.070	.005	0.364	25.2	150.6	45.0	498	169	81.8	1,143	11.
0.488	0.064	.005	10.671	13.6	113.3	41.0	393	155	85.7	18,300	5.
0.331	**0.055**	**.004**	**2.363**	**19.2**	**148.0**	**34.3**	**422**	**131**	**88.9**	**4,384**	....
0.364	0.067	Trace.	0.400	42.1	160.4	75.8	620	201	99.0	723	30.
0.460	0.168	.015	0.281	51.7	150.2	12.6	431	37	88.1	6,900	28.
0.380	0.076	.008	0.197	30.3	173.8	0.	381	116	83.9	5,720	21.
0.372	0.080	.015	1.140	77.2	159.6	40.4	568	170	79.7	7,540	11.
0.320	0.080	.010	9.671	26.7	140.7	38.8	4 0	165	79.0	22,040	5.
0.379	**0. 94**	**.010**	**2.338**	**46.5**	**156.9**	**33.5**	**432**	**138**	**85.9**	**8,585**	....
0.288	0.094	Trace.	0.454	29.5	146.8	20.0	390	106	80.0	569	27.
0.263	0.058	Trace.	0.322	64.3	137.2	31.2	439	47	92.3	210	26.5
0.210	0.054	Trace.	0.225	104.6	144.6	12.2	486	115	70.5	575	18.
0.266	0.042	.005	0.260	36.1	156.4	41.0	399	130	79.3	5,450	9.5
0.316	0.040	.006	10.250	8.1	118.2	24.2	395	125	85.5	7,710	3.
0.269	**0.058**	**.002**	**2.302**	**48.5**	**140.6**	**25.7**	**422**	**105**	**81.5**	**2,903**	....
0.297	0.115	.002	0.418	32.7	152.6	47.3	436	116	75.0	992	27.5
0.360	0.094	.001	0.356	66.0	139.8	14.8	480	68	96.6	4,315	26.
0.368	0.072	.002	0.246	81.1	153.8	32.0	573	181	77.8	1,100	19.5
0.312	0.092	.008	0.284	37.2	168.2	43.6	474	152	79.1	26,520	10.
0.556	0.068	.007	10.041	12.2	112.8	26.6	421	133	74.8	16,400	3.
0.379	**0.088**	**.004**	**2.269**	**45.8**	**145.4**	**32.9**	**477**	**130**	**80.7**	**9,865**	....
0.262	0.088	.015	0.254	29.2	156.6	40.2	365	96	83.0	* 270	28.
0.322	0.068	Trace.	0.272	50.2	150.2	5.0	434	15	78.6	* 250	26.
0.276	0.022	None,	0.135	60.2	154.9	20.4	515	170	94.1	195	21.
0.328	0.028	.010	0.168	34.4	142.4	31.0	462	143	80.3	1,342	11,
0.504	0.146	.008	8.274	21.1	122.4	13.6	439	99	91.3	7 360	5.5
0.338	**0.070**	**.007**	**1.821**	**39.0**	**145.3**	**22.0**	**443**	**105**	**85.5**	**1,883**	....

* Count low owing to interference from overspreading growth

MAUMEE WATERSHED—Concluded.

Maumee River—Concluded.

(Parts per million.)

Station.	Sample number.	Approximate distances.	Location of sample.	Date collected.		Color.	Turbidity.	Sediment.	Odor.	Oxygen required.
				Month.	Day.					
6a	24	31-119	Toledo, Cherry St. bridge	July	23	.1	Dis.	S.	Offensive	5.94
	47	1-127	" "	Aug.	25	.28	V. S.	S.	Musty	6.36
	73	2-117	" "	Sept.	27	.42	V. S.	S.	Faint sour	10.05
	99		" "	Oct.	26	.4	Dis.	S.	Musty	7.95
	116		" "	Nov.	14	.3	Dec.	C.	Earthy	18.01
			Average			.30				9.62
6b	25	31-120	Toledo, Riverside Park	July	23	.1	Dis.	S.	Offensive	5.85
	46	1-128	" "	Aug.	25	.3	V. S.	S.	Musty	7.01
	74	2-118	" "	Sept.	27	.45	V. S.	S.	Faint sour	9.99
	101		" "	Oct.	26	.4	Dis.	S.	Musty	8.56
	115		" "	Nov.	14	.3	Dec.	C.	E'thy, f't oily	18.17
			Average			.31				9.92

MAUMEE WATERSHED—Concluded.

MAUMEE RIVER—Concluded.

(Parts per million.)

Nitrogen as											
Albuminoid ammonia.	Free ammonia.	Nitrites.	Nitrates.	Chlorine.	Alkalinity.	Incrusting constituents.	Total solids.	Loss on ignition.	Dissolved oxygen—Per cent. saturation.	Bacteria per C. C.	Temperature ° C.
0.332	0.168	.030	0.364	29.4	164.2	65.8	372	98	47.0	1,030	28.
0.340	0.244	.015	0.336	44.5	143.6	9.2	481	111	46.3	5,310	26.
0.420	0.208	.009	0.145	63.6	161.5	19.5	491	163	57.6	4,275	21.
0.308	0.051	.011	0.352	63.8	141.6	32.8	456	143	65.4	4,250	10.
0.504	0.104	.009	8.140	32.3	130.2	28.0	432	131	82.1	19,160	5.
0.381	**0.156**	**.015**	**1.867**	**46.7**	**148.2**	**31.1**	**446**	**130**	**59.7**	**6,805**	....
0.286	0.109	.035	0.368	26.6	157.0	46.1	338	58	78.0	576	28.
0.356	0.280	.021	0.300	40.6	148.4	18.0	502	142	54.4	* 220	26.
0.348	0.248	.019	0.152	63.3	158.8	23.6	449	150	56.1	4,370	21.
0.332	0.104	.011	0.256	64.3	140.0	30.6	524	148	83.4	13 600	10.
0.476	0.096	.010	8.581	28.1	128.4	32.0	473	141	77.9	16,100	5.
0.360	**0.167**	**.019**	**1.931**	**44.6**	**146.5**	**30.1**	**457**	**128**	**70.0**	**6,973**	....

* Count low owing to interference from overspreading growth.

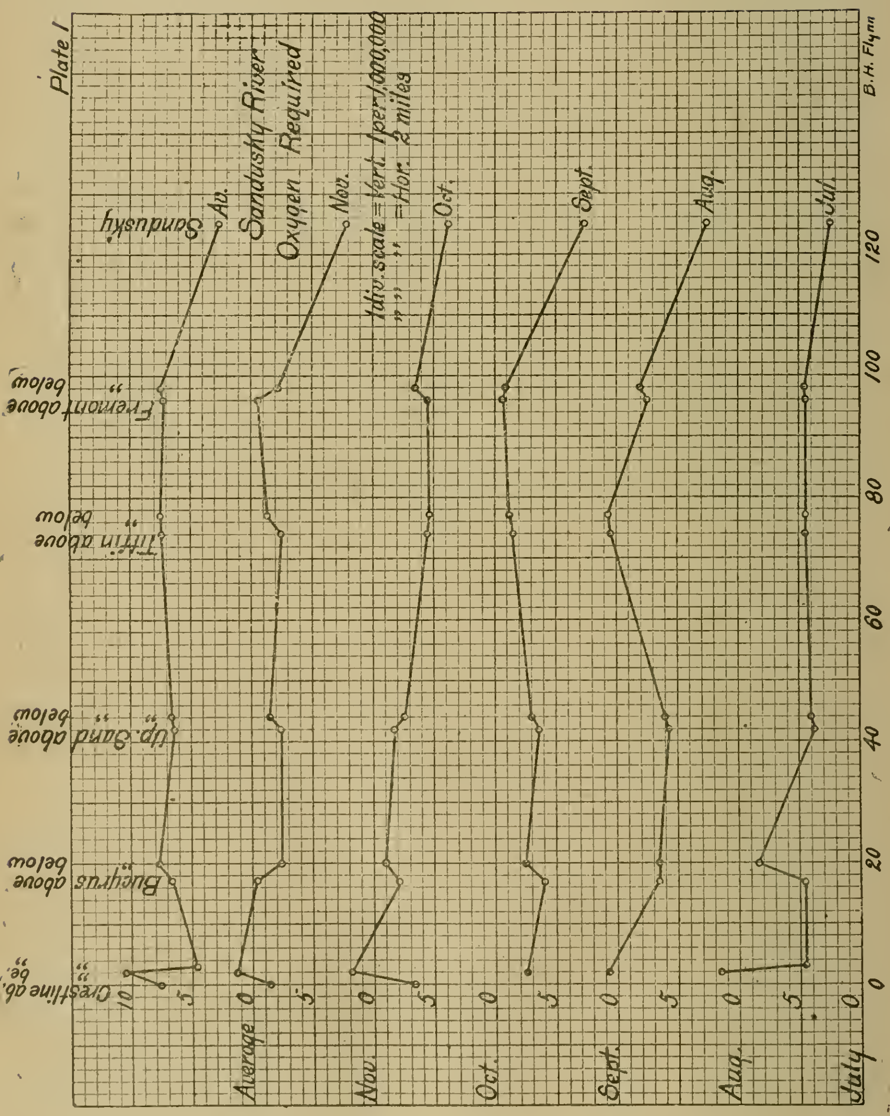


Plate I
Sandusky River
Oxygen Required
1 div. scale = Vert. 1 per 1,000,000
" " " = Hor. 2 miles
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Average
Nov.
Oct.
Sept.
Aug.
July
Crestline ab.
" be.
Bucyrus above
" below
Up. Sand above
" below
Tiffin above
" below
Fremont above
" below
Sandusky
0
20
40
60
80
100
120
10
5
0
B.H. Flynn

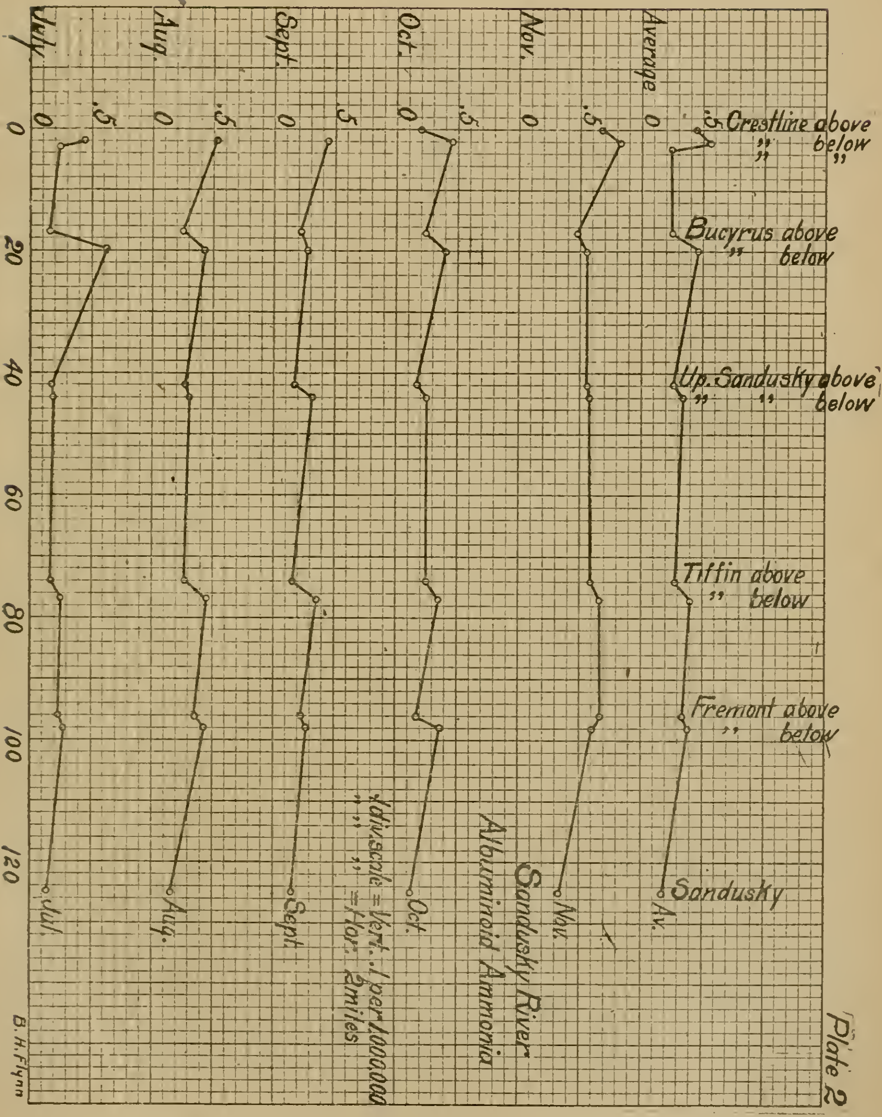


Plate 2
Sandusky River
Albuminoid Ammonia
1 div. scale = Vert. .1 per 1,000,000
" " " = Hor. 2 miles
July
Aug.
Sept.
Oct.
Nov.
Average
0
.5
0
20
40
60
80
100
120
Crestline above
" below
Bucyrus above
" below
Up. Sandusky above
" " below
Tiffin above
" below
Fremont above
" below
Sandusky
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
B. H. Flynn

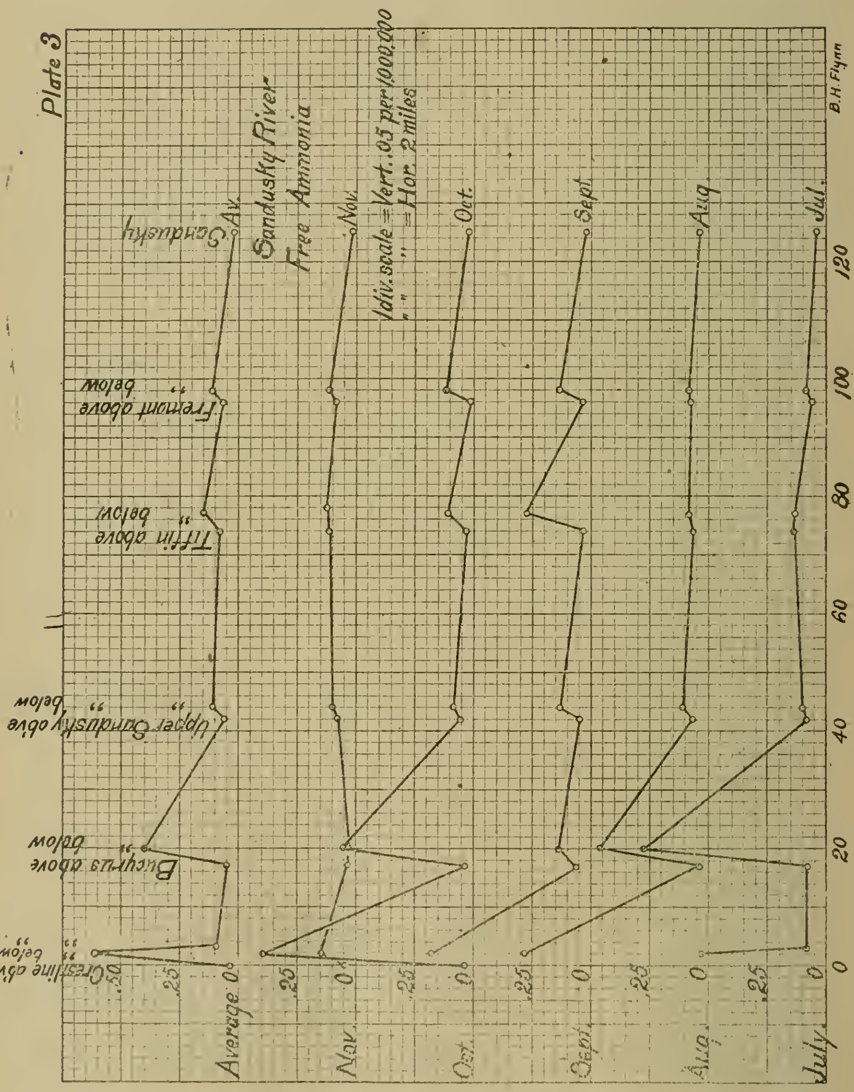


Plate 3
Sandusky River
Free Ammonia
1 div. scale = Vert. .05 per 1,000,000
" " " = Hor. 2 miles
B.H. Flynn
Crestline above
" below
Bucyrus above
" below
Upper Sandusky above
" below
Tiffin above
" below
Fremont above
" below
Sandusky
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Average 0
.25
.50
Nov. 0
.25
Oct. 0
.25
Sept. 0
.25
Aug. 0
.25
July 0
0
20
40
60
80
100
120

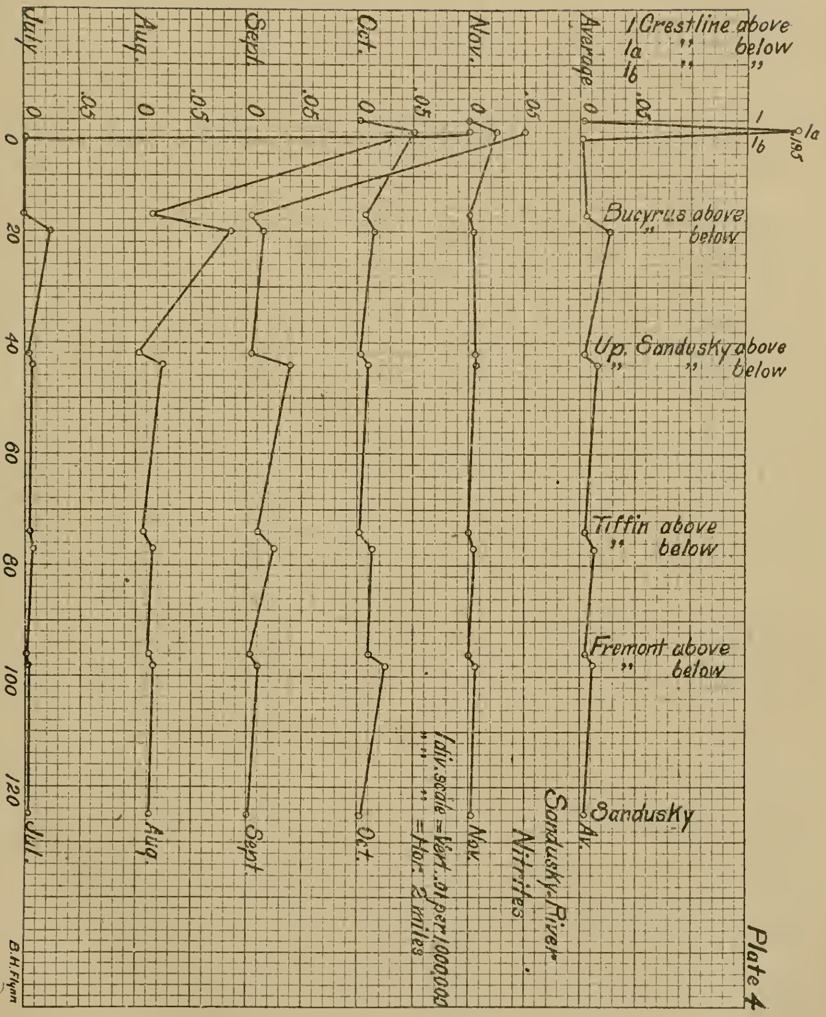


Plate 4
Sandusky River
Nitrites
1 div. scale = Vert. .01 per 1,000,000
" " " = Hor. 2 miles
1 Crestline above
1a " below
1b " "
Bucyrus above
" below
Up. Sandusky above
" " below
Tiffin above
" below
Fremont above
" below
Sandusky
Average
Nov.
Oct.
Sept.
Aug.
July
Av.
Jul.
0
.05
.195
0
20
40
60
80
100
120
B. H. Flynn

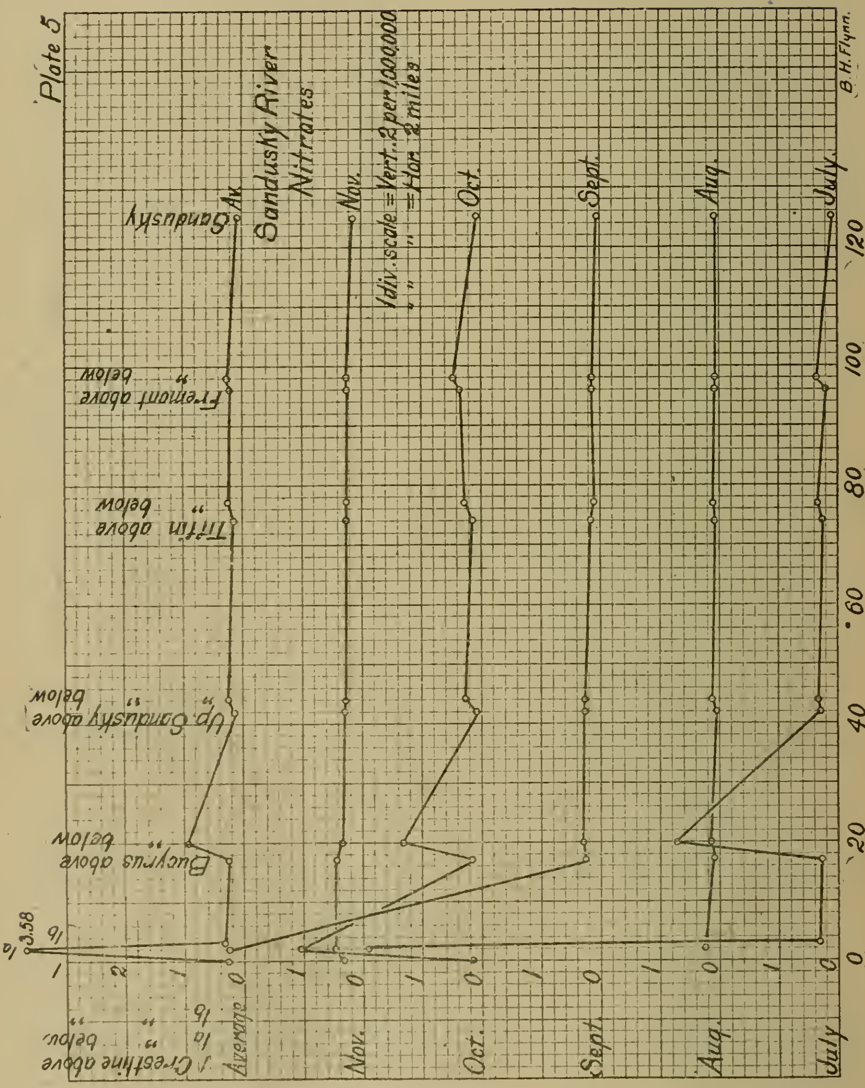


Plate 5
Sandusky River
Nitrates.
1 div. scale = Vert. .2 per 1,000,000
" " " = Hor. 2 miles
B. H. Flynn.
1a } Crestline above
1b " below
Bucyrus above
" below
Up. Sandusky above
" below
Tiffin above
" below
Fremont above
" below
Sandusky
3.58
Average
Nov.
Oct.
Sept.
Aug.
July
Av.
0
1
2
20
40
60
80
100
120

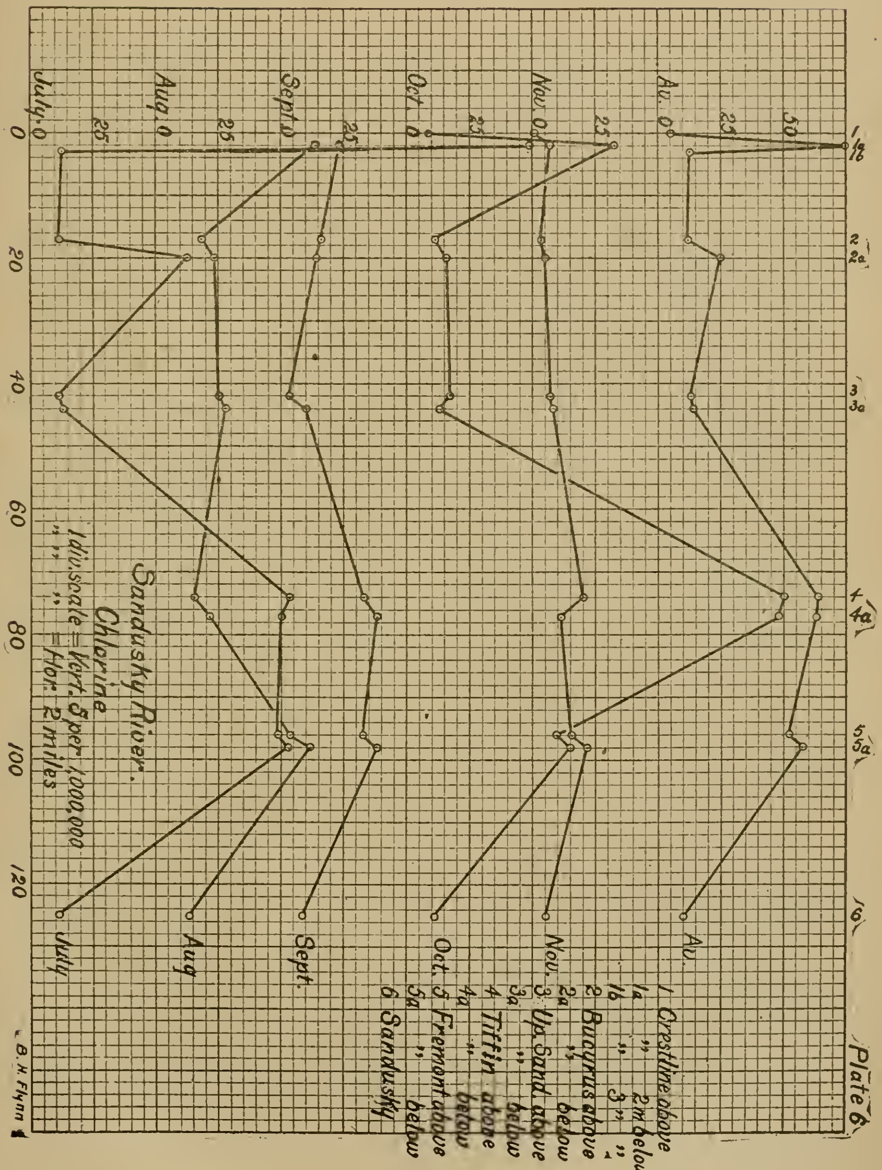


Plate 6
Sandusky River.
Chlorine
1 div. scale = Vert. 5 per 1,000,000
,, ,, ,, = Hor. 2 miles
1 Crestline above
1a ,, 2m below
1b ,, 3 ,, ,,
2 Bucyrus above
2a ,, below
3 Up. Sand. above
3a ,, below
4 Tiffin above
4a ,, below
5 Fremont above
5a ,, below
6 Sandusky
Av. 0
25
50
Nov. 0
25
Oct. 0
25
Sept. 0
25
Aug. 0
25
July 0
25
0
20
40
60
80
100
120
1
1a
1b
2
2a
3
3a
4
4a
5
5a
6
Av.
Nov.
Oct.
Sept.
Aug.
July
B. H. Flynn

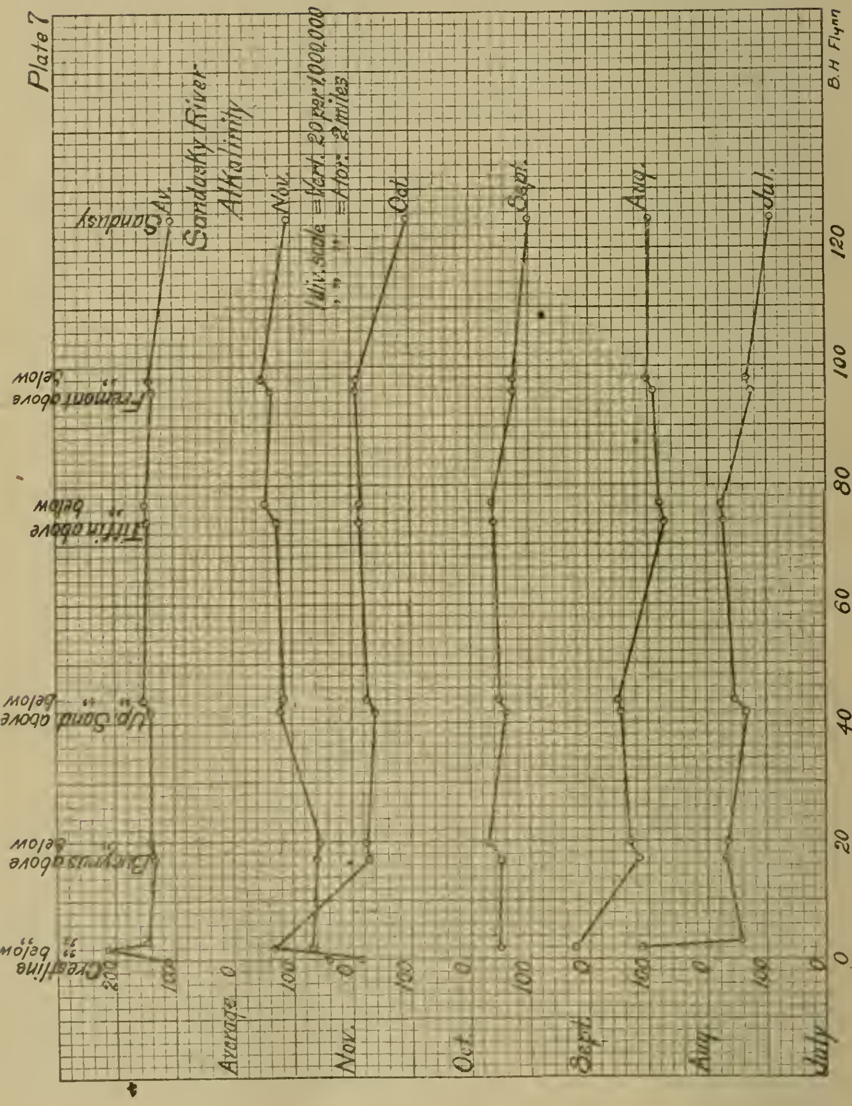
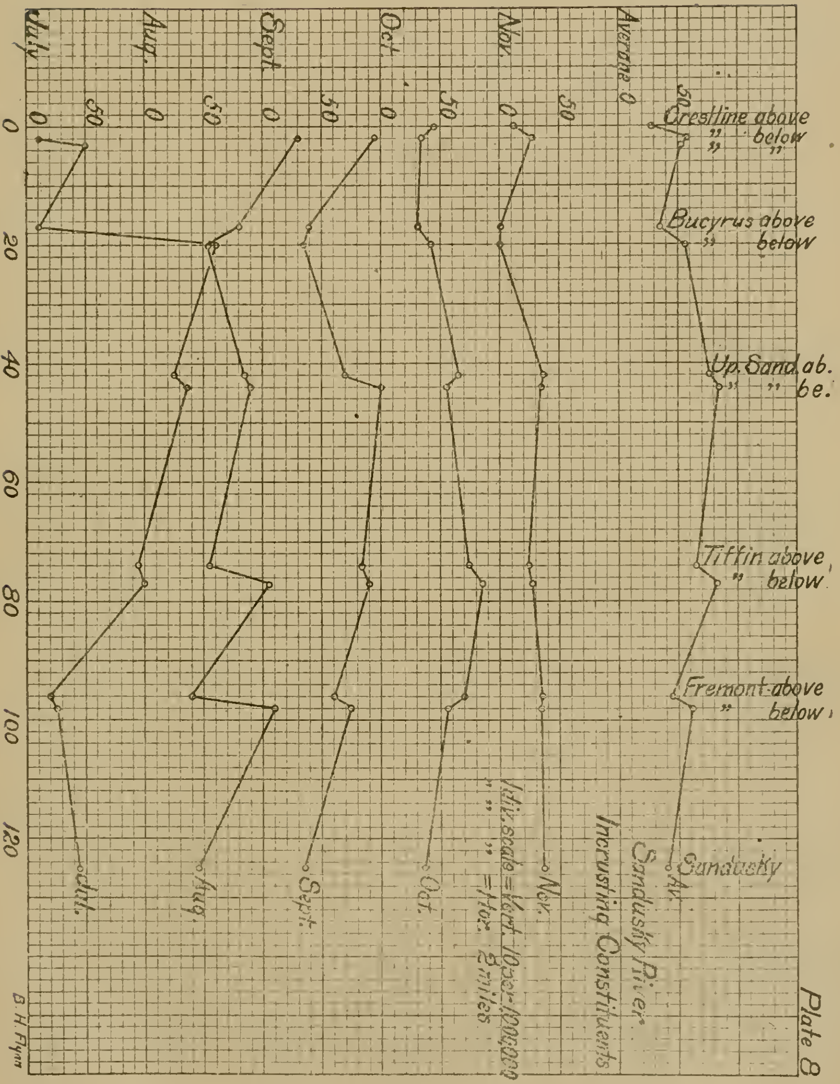


Plate 7
Sandusky River
Alkalinity
1 div. scale = Vert. 20 per 1000,000
" " " = Hor. 2 miles
Sandusky
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Fremont above
" below
Tiffin above
" below
Up. Sand. above
" below
Bucyrus above
" below
Crestline
" below
Average 0
200
100
Nov.
100
0
Oct.
100
0
Sept.
100
0
Aug.
100
0
July
0
20
40
60
80
100
120
B.H. Flynn



Sandusky River.
Incrusting Constituents

Plate 8

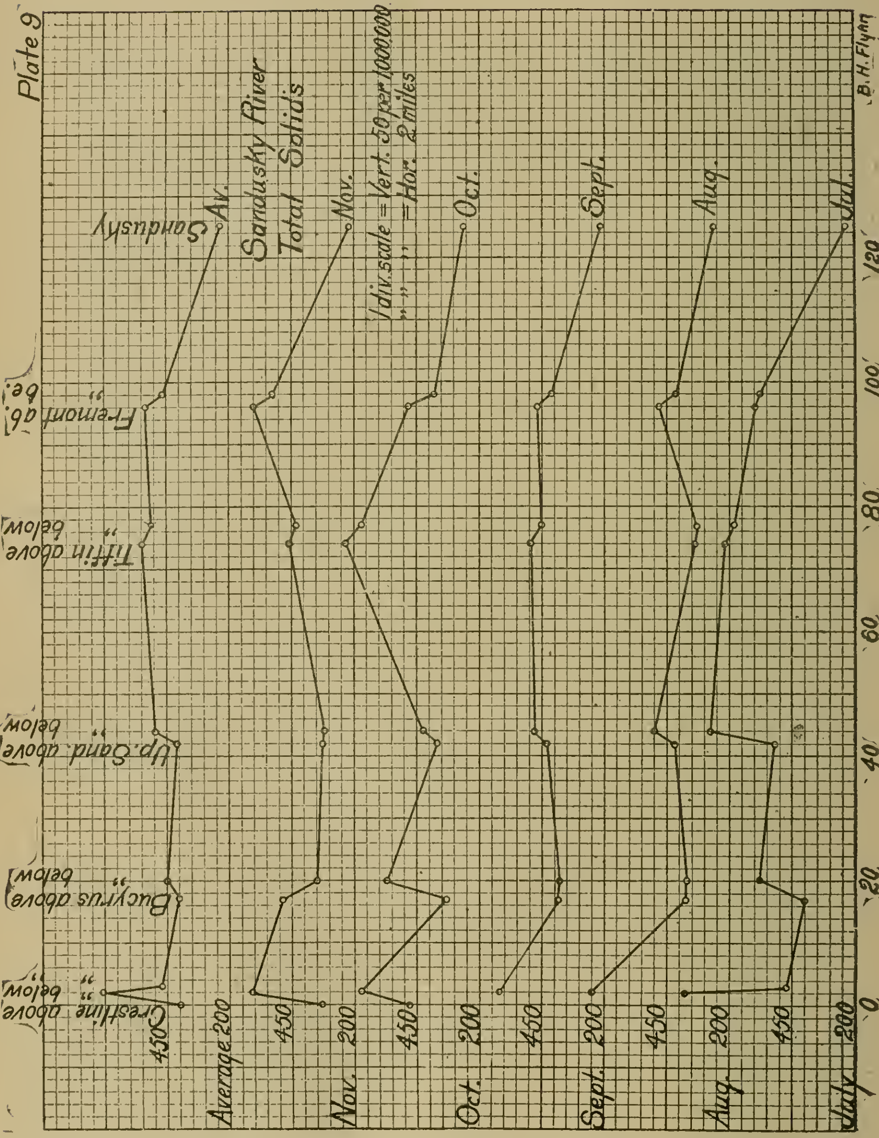


Plate 9
Sandusky River
Total Solids
1 div. scale = Vert. 50 per 1,000,000
" " = Hor. 2 miles
B.H. Flynn
Crestline above
" below
Bucyrus above
" below
Up. Sand. above
" below
Tiffin above
" below
Fremont ab.
" be.
Sandusky
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
0
20
40
60
80
100
120
Average 200
450
450
Nov. 200
450
Oct. 200
450
Sept. 200
450
Aug. 200
450
July 200

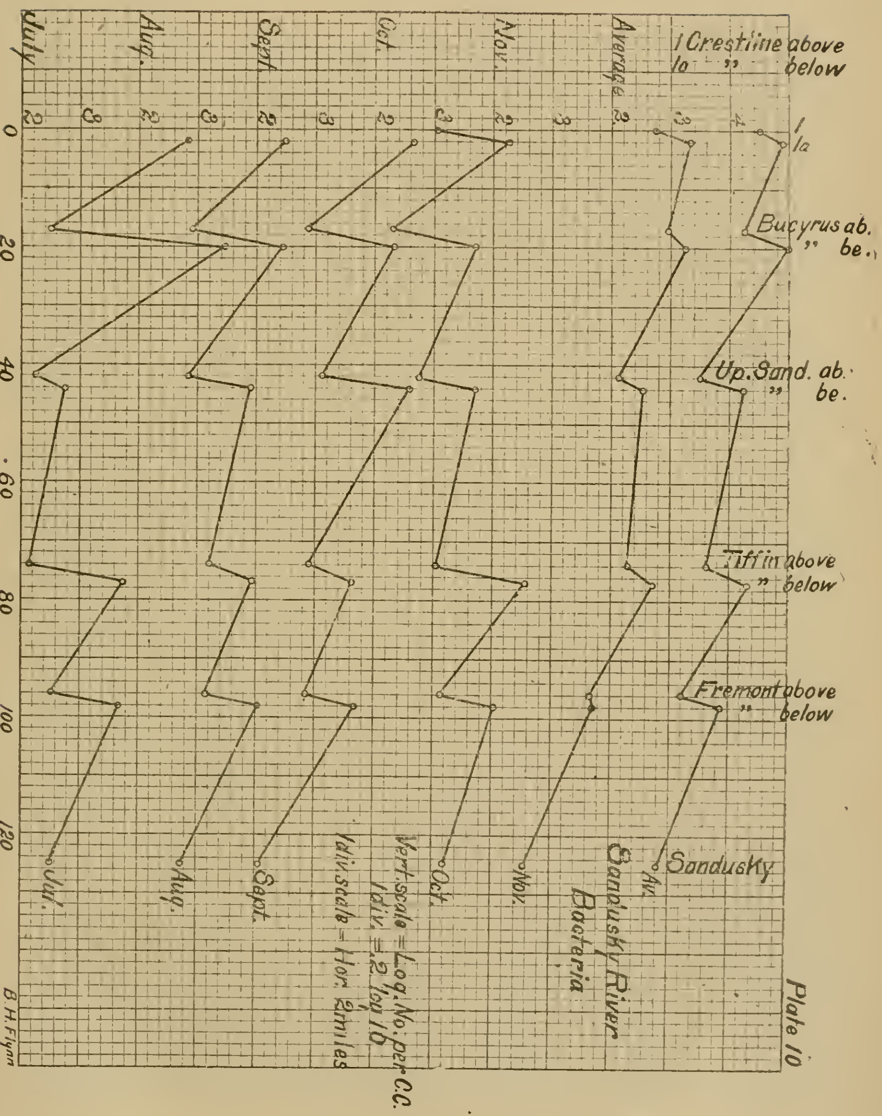


Plate 10
Sandusky River
Bacteria
Vert. scale = Log. No. per C.C.
1 div. = .2 log 10
1 div. scale = Hor. 2 miles
July
Aug.
Sept.
Oct.
Nov.
Average
1 Crestline above
1a " below
Bucyrus ab.
" be.
Up. Sand. ab.
" be.
Tiffin above
" below
Fremont above
" below
Sandusky
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
0
20
40
60
80
100
120
2
3
4
1
1a
B.H. Flynn

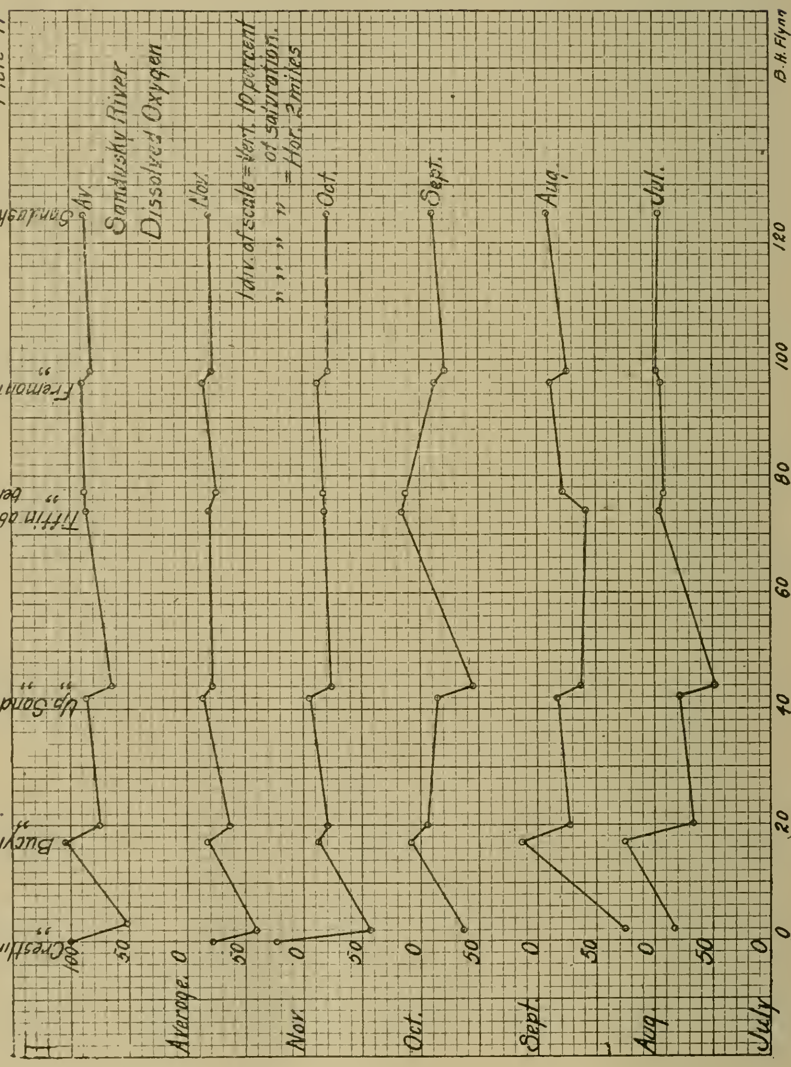


Plate 11
Sandusky River
Dissolved Oxygen
1 div. of scale = Vert. 10 percent of saturation.
„ „ „ „ = Hor. 2 miles
B.H. Flynn
Crestline ab.
„ be.
Bucyrus ab.
„ be.
Up. Sand. ab.
„ be.
Tiffin above
„ below
Fremont ab.
„ be.
Sandusky
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Average 0
Nov. 0
Oct. 0
Sept. 0
Aug. 0
July 0
100
50
0
20
40
60
80
100
120

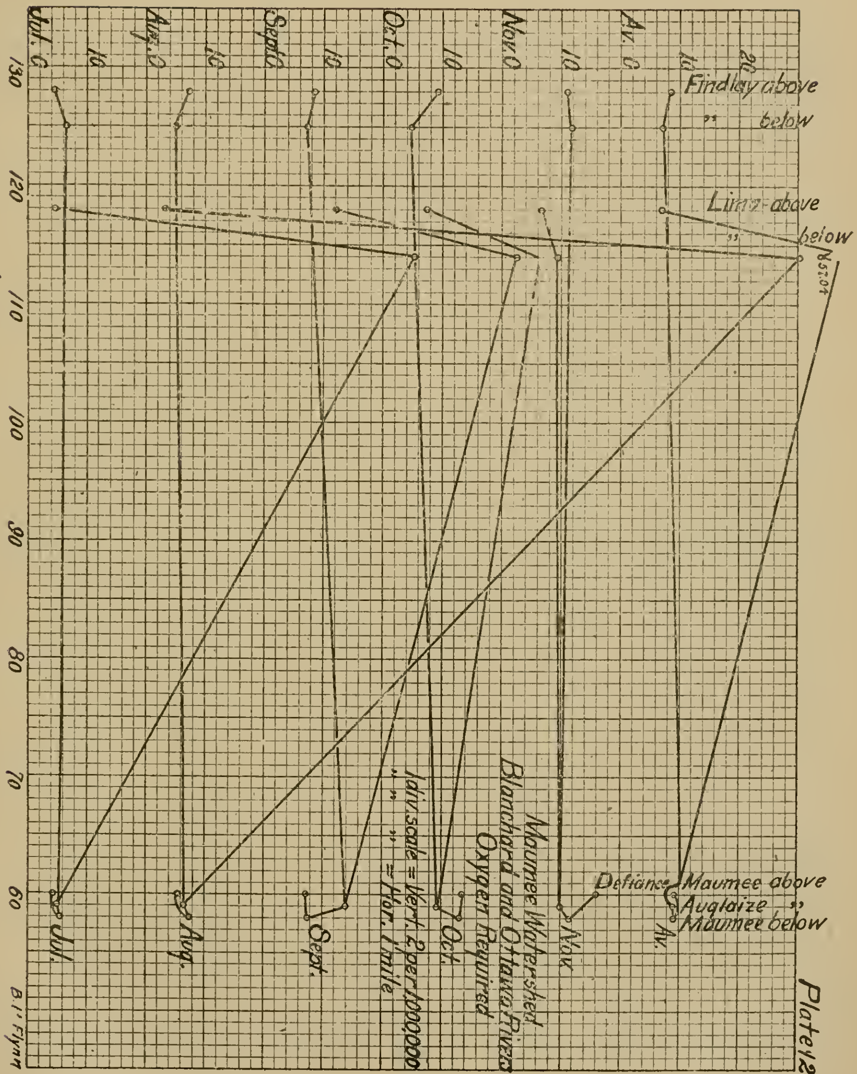
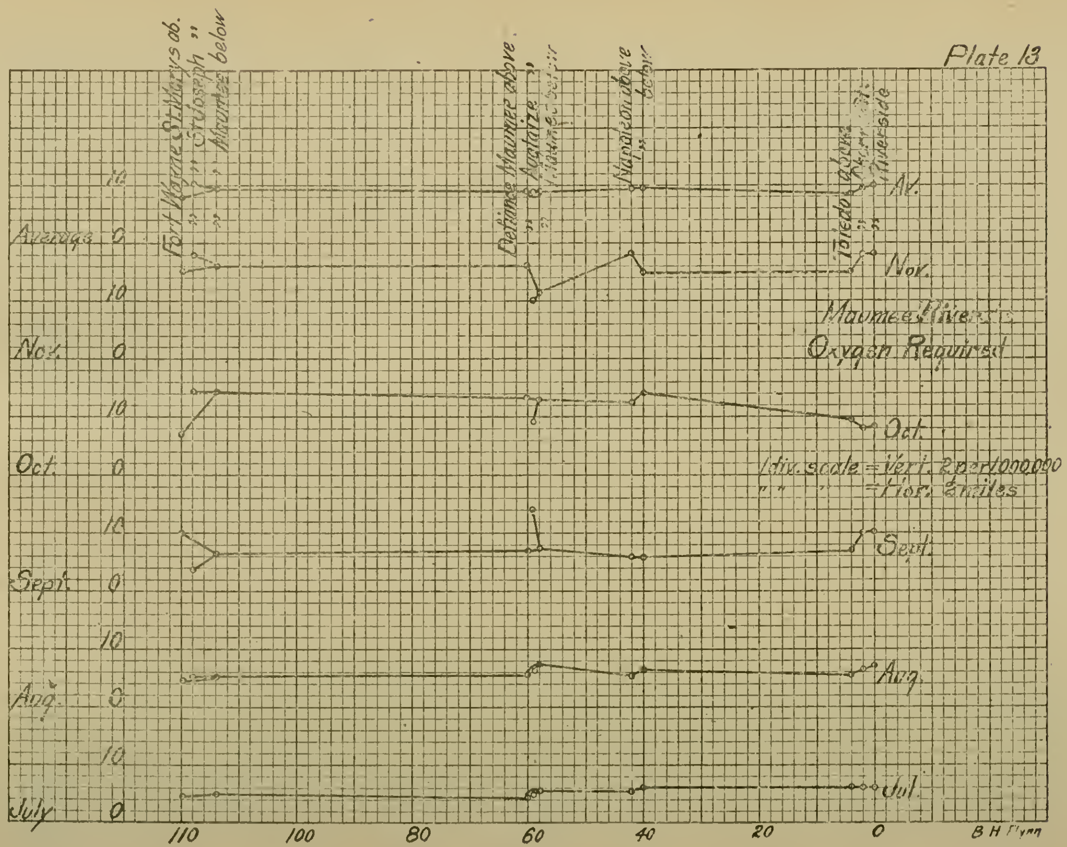

Jul. 0
10
Aug. 0
10
Sept. 0
10
Oct. 0
10
Nov. 0
10
Av. 0
10
20
Findlay above
" below
Lima above
" below
85.04
130
120
110
100
90
80
70
60
Defiance
Maumee above
Auglaize "
Maumee below
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
Maumee Watershed
Blanchard and Ottawa Rivers
Oxygen Required
1 div. scale = Vert. 2 per 1,000,000
" " " = Hor. 1 mile
B. I' Flynn

Plate 12

Plate 13


Maumee River
Oxygen Required
1 div. scale = Vert. 2 per 1000000
" " " = Hor. 2 miles
Fort Wayne St Marys ab.
" " St Joseph "
" " Maumee below
Defiance Maumee above
" Auglaize "
" Maumee below
Napoleon above
" below
Toledo above
" [illegible]
" Riverside
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Average
Nov.
Oct.
Sept.
Aug.
July
0
10
110
100
80
60
40
20
0
B H Flynn

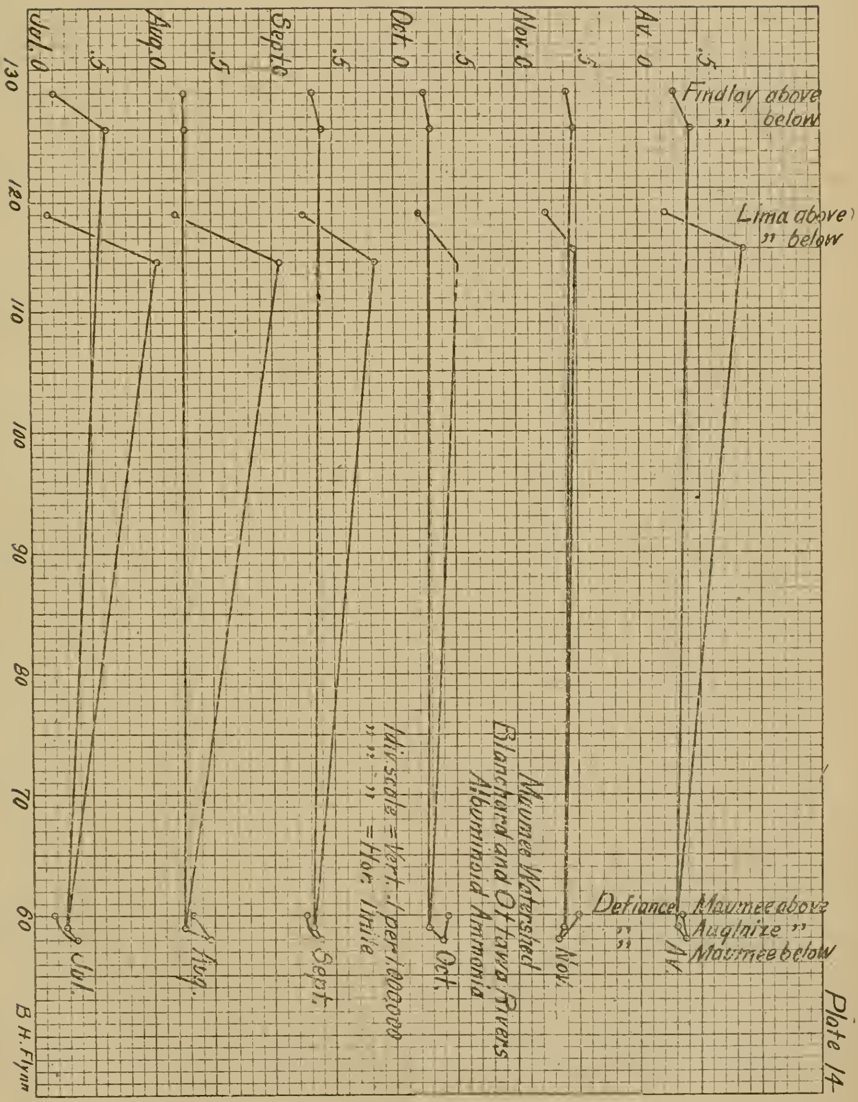

Jul. 0
.5
Aug. 0
.5
Sept. 0
.5
Oct. 0
.5
Nov. 0
.5
Av. 0
.5
130
120
110
100
90
80
70
60
Findlay above
" below
Lima above
" below
Defiance
"
Maumee above
Auglaize "
Maumee below
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
Maumee Watershed
Blanchard and Ottawa Rivers.
Albuminoid Ammonia
1 div. scale = Vert. 1 per 1.000000
" " " = Hor. Limits
B. H. Flynn

Plate 14

Plate 15

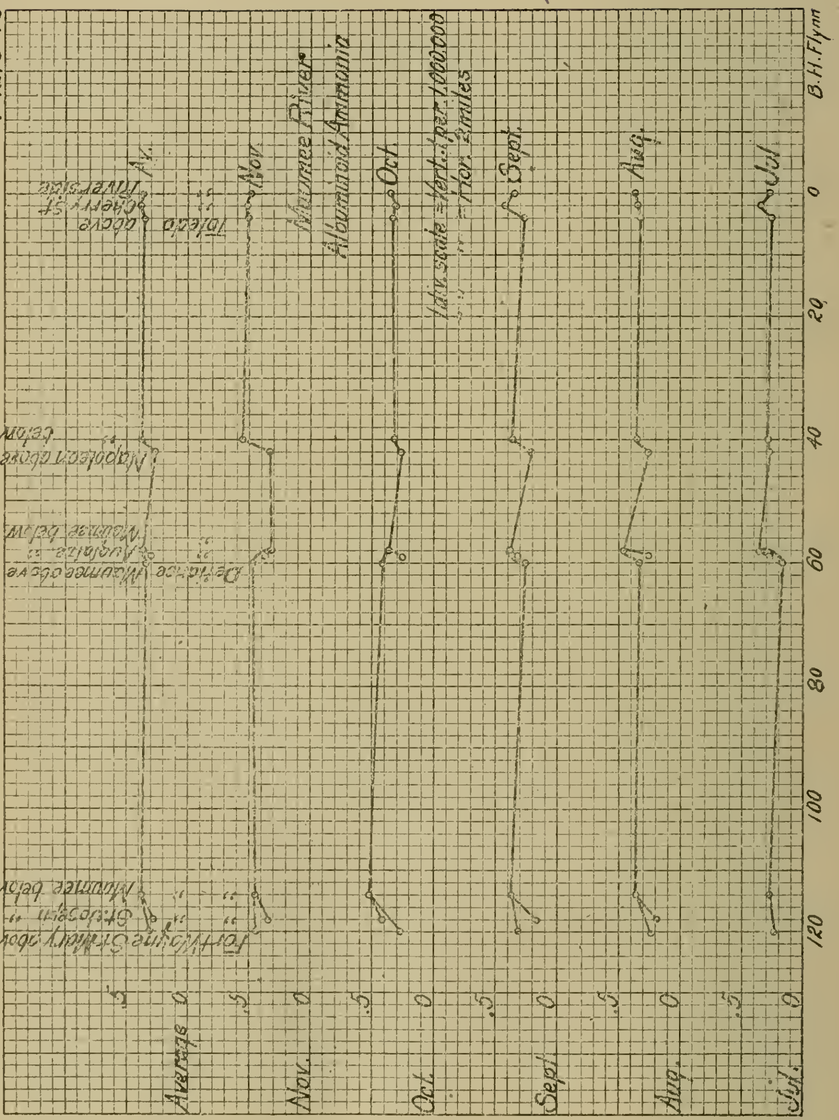

Maumee River
Albuminoid Ammonia
1 div. scale = Vert. 1 per 1,000,000
" " " Hor. 2 miles
B.H.Flynn
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Ft. Wayne St. Mary above
St. Joseph "
Maumee below
Defiance Maumee above
Auglaize "
Maumee below
Napoleon above
" below
Toledo above Cherry St.
" Riverside
0
20
40
60
80
100
120
Average
.5
0

Plate 16

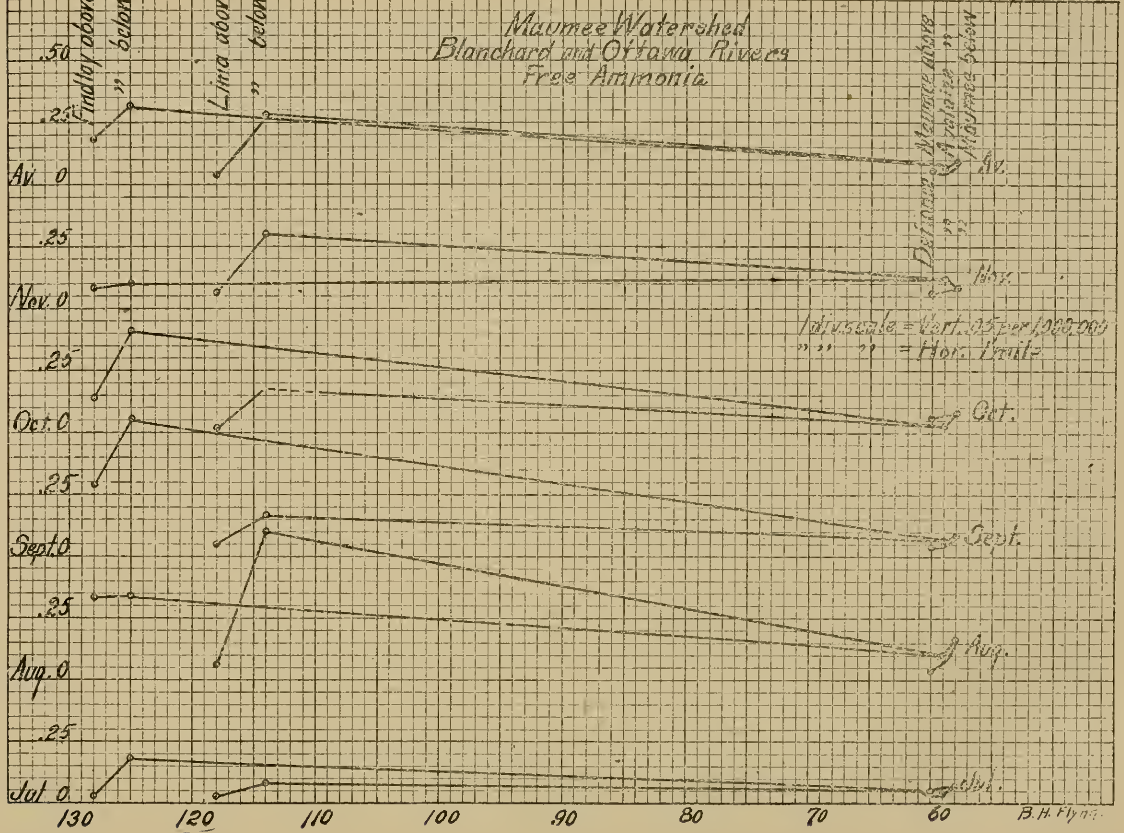

Maumee Watershed
Blanchard and Ottawa Rivers
Free Ammonia
Findlay above
" below
Lima above
" below
Defiance { Maumee above
" Auglaize "
" Maumee below
1 div. scale = Vert. .05 per 1,000,000
" " " = Hor. 1 mile
Av. 0
.25
.50
Nov. 0
.25
Oct. 0
.25
Sept. 0
.25
Aug. 0
.25
Jul. 0
.25
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
130
120
110
100
90
80
70
60
B. H. Flynn

Plate 17

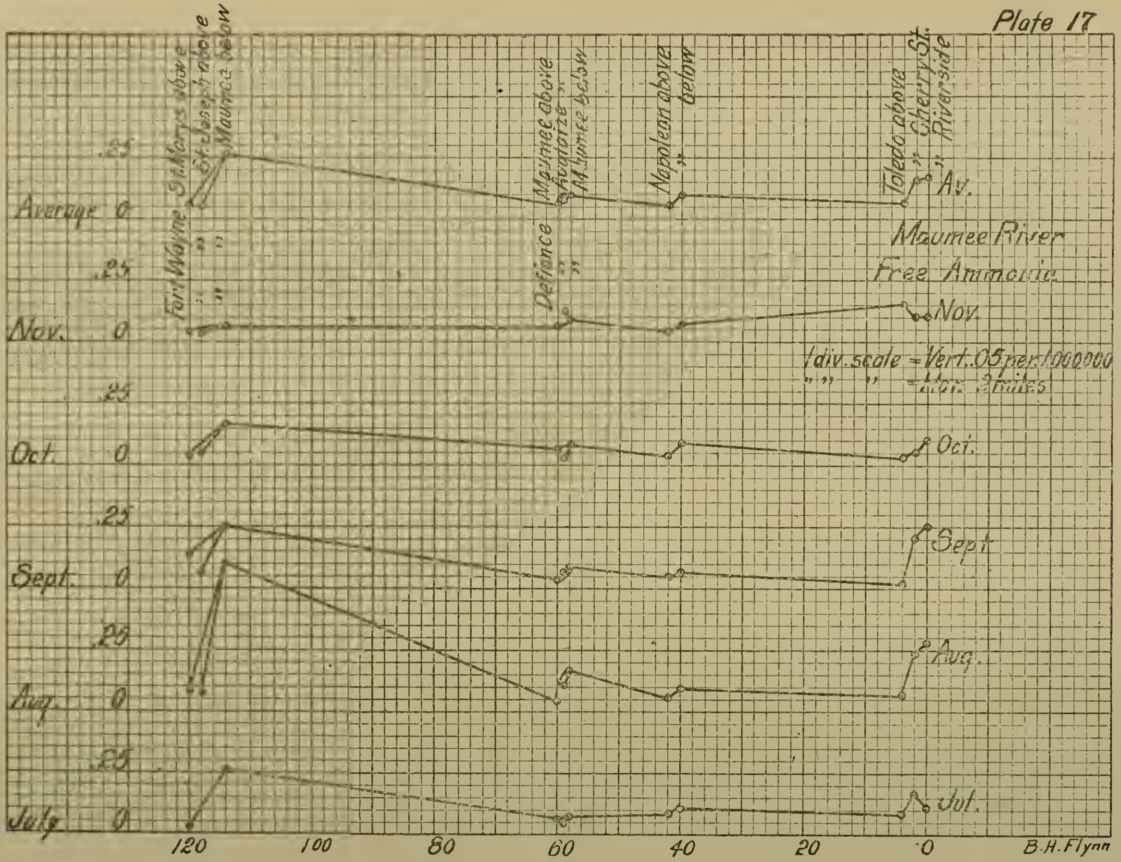

Fort Wayne St. Marys above
" St. Joseph above
" Maumee below
Defiance Maumee above
" Auglaize "
" Maumee below
Napoleon above
" below
Toledo above
" Cherry St.
" Riverside
Av.
Maumee River
Free Ammonia
Nov.
1 div. scale = Vert. .05 per 1000000
" " " = Hor. 3 miles
Oct.
Sept.
Aug.
Jul.
Average 0
.25
Nov. 0
.25
Oct. 0
.25
Sept. 0
.25
Aug. 0
.25
July 0
120
100
80
60
40
20
0
B.H. Flynn

Plate 18

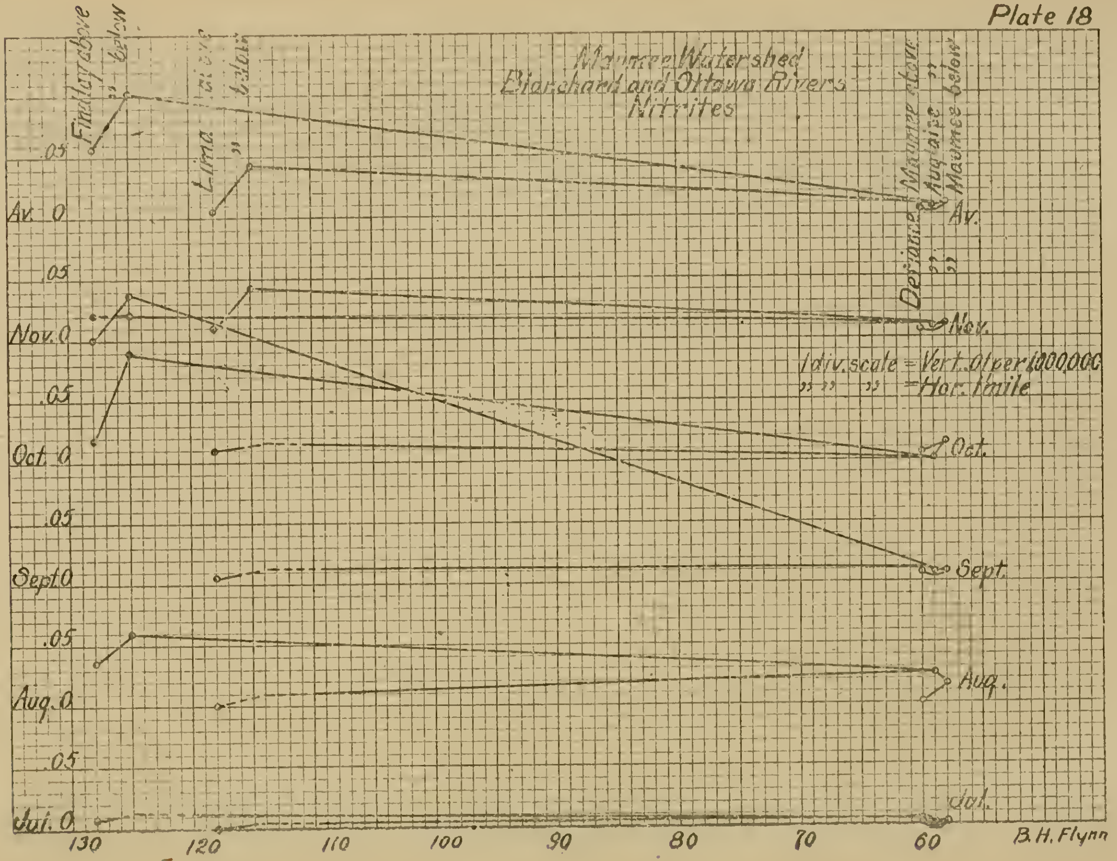

Maumee Watershed
Blanchard and Ottawa Rivers
Nitrites
Findlay above
" below
Lima above
" below
Defiance
Maumee above
" Auglaize "
" Maumee below
1 div. scale = Vert. 0 l per 1000,000
" " " = Hor. 1 mile
Av. 0
.05
Nov. 0
.05
Oct. 0
.05
Sept 0
.05
Aug. 0
.05
Jul. 0
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
130
120
110
100
90
80
70
60
B. H. Flynn

Plate 19

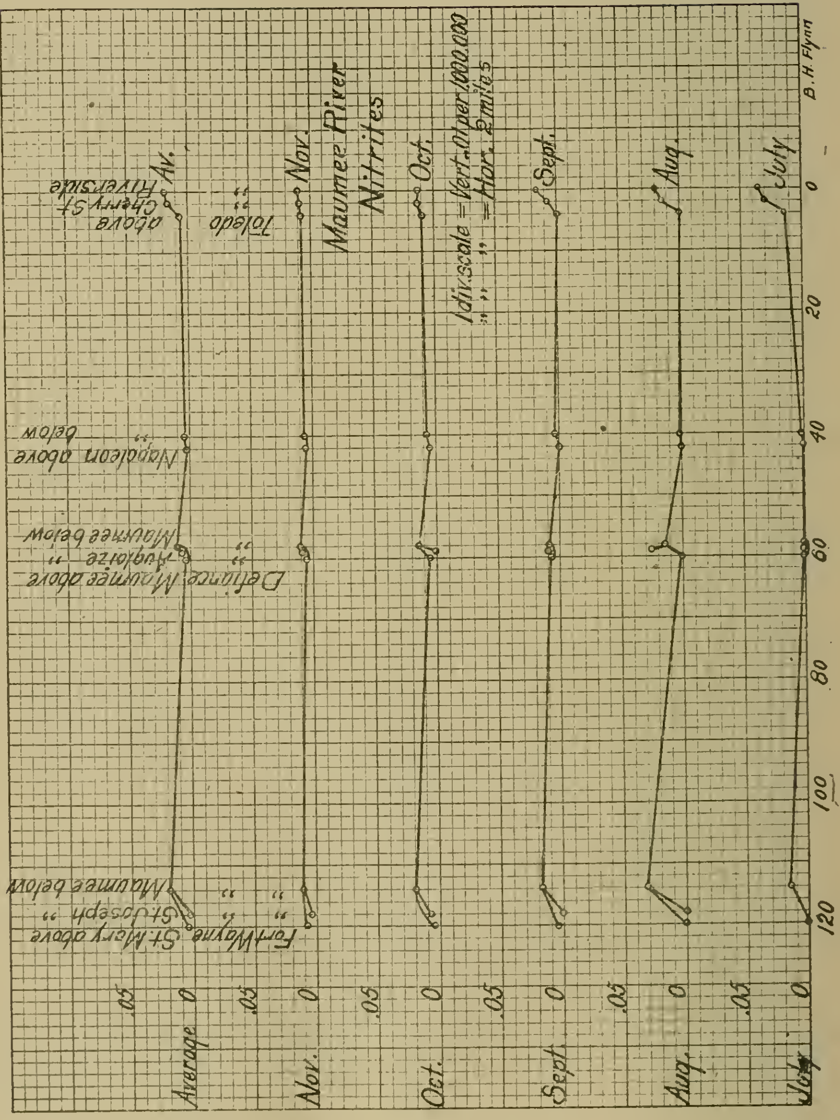
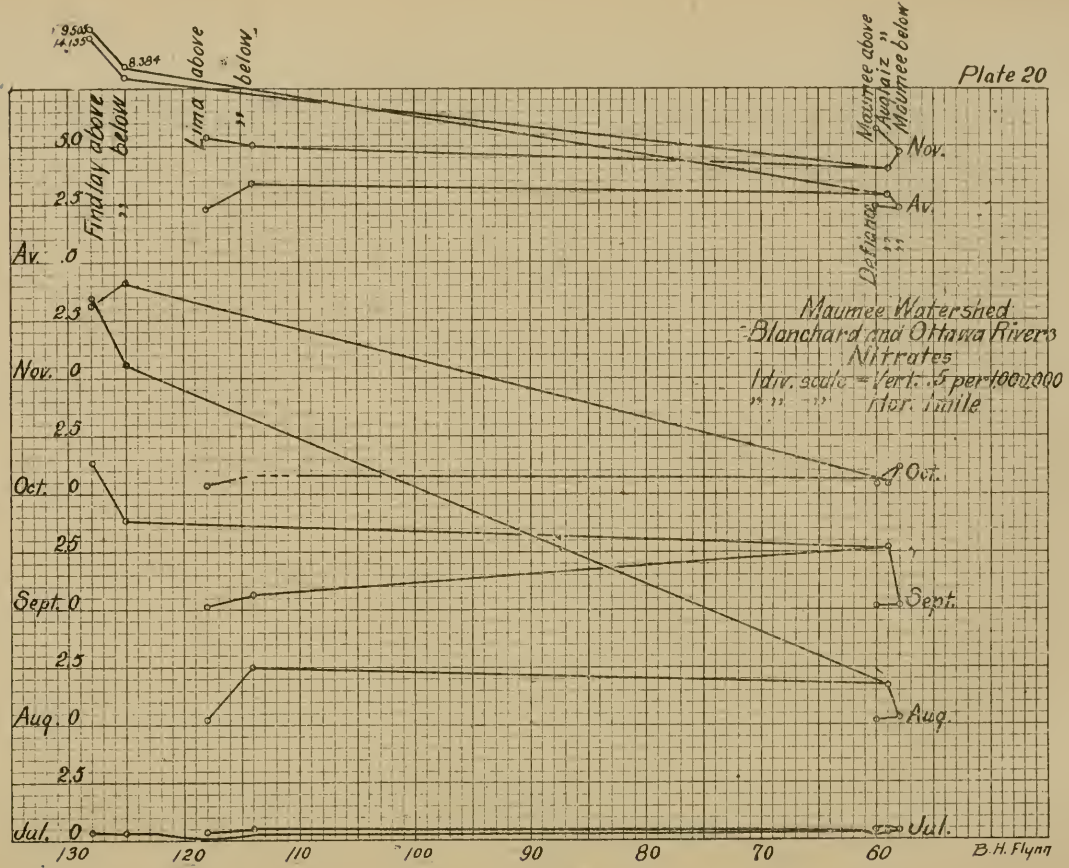

Maumee River
Nitrites
1 div. scale = Vert. .01 per 1,000,000
" " " = Hor. 2 miles
B. H. Flynn
Fort Wayne St. Mary above
" St. Joseph "
" Maumee below
Defiance Maumee above
" Auglaize "
" Maumee below
Napoleon above
" below
Toledo above
" Cherry St.
" Riverside
Average
Nov.
Oct.
Sept.
Aug.
July
Av.
0
.05
0
20
40
60
80
100
120

Plate 20



Maumee Watershed
Blanchard and Ottawa Rivers
Nitrates
1 div. scale = Vert. .5 per 1000,000
" " " Hor. 1 mile

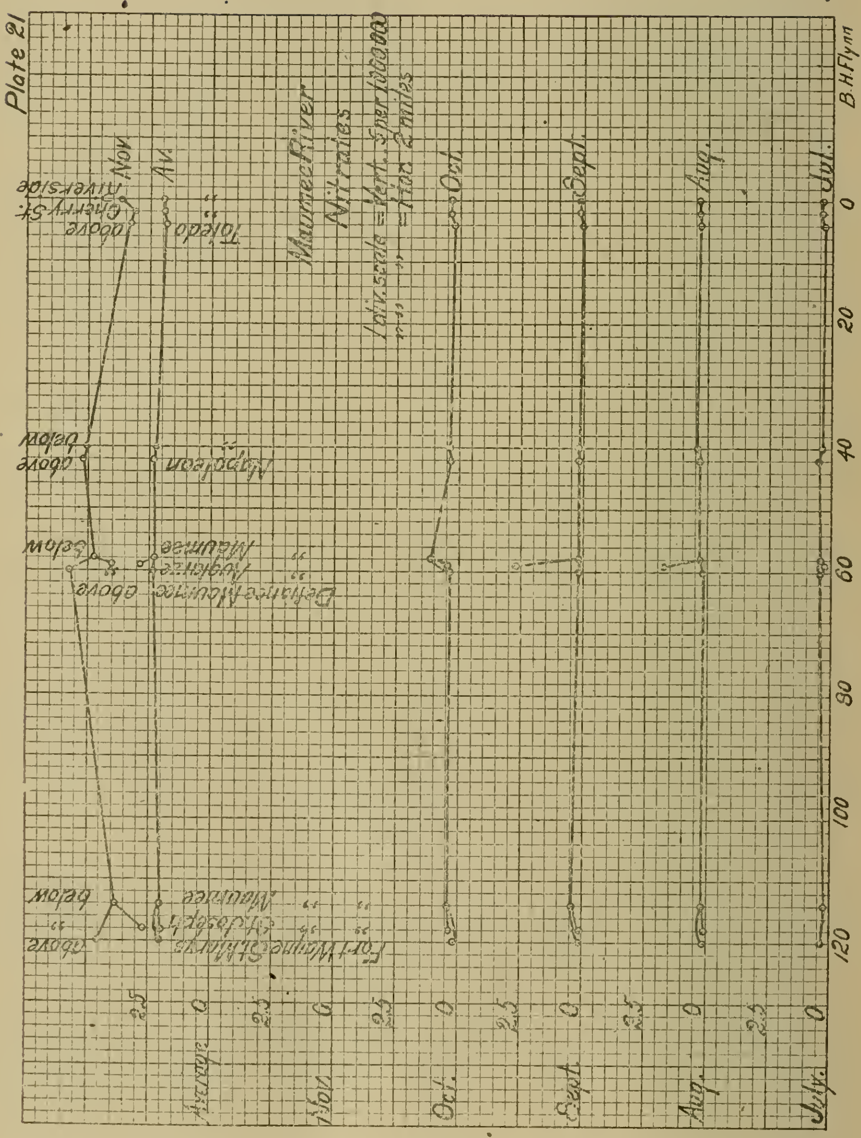
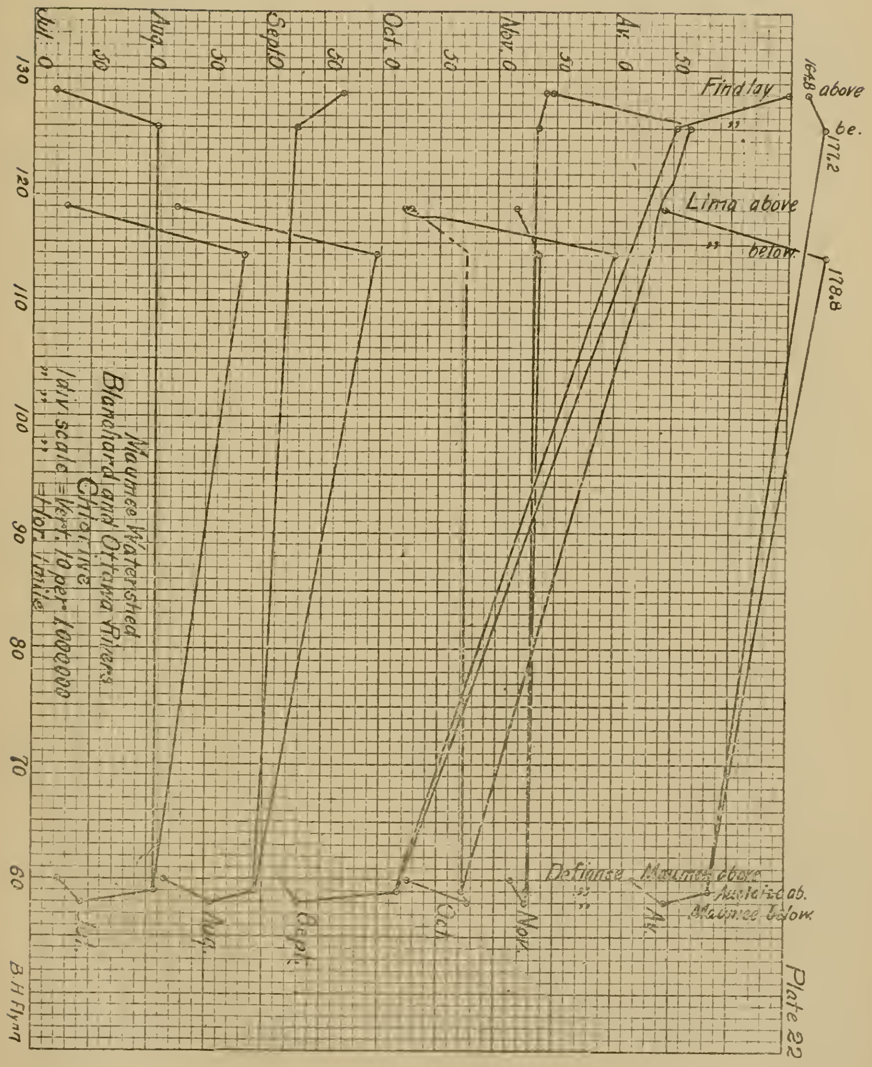


Plate 21
Maumee River
Nitrates
1 div. scale = Vert. .5 per 1000000
" " " = Hor. 2 miles
B.H.Flynn
Riverside
Cherry St.
above
Toledo
above
below
Napoleon
below
Maumee
Auglaize
above
Defiance
Maumee
below
Maumee
St. Joseph
St. Marys
above
Fort Wayne
Nov.
Av.
Oct.
Sept.
Aug.
Jul.
0
20
40
60
80
100
120
2.5
0
Average
Nov.
Oct.
Sept.
Aug.
July.


Maumee Watershed
Blanchard and Ottawa Rivers.
Chlorine
1 div scale = Vert. 10 per 1000000
" " " = Hor. 1 mile
Jul. 0
50
Aug. 0
50
Sept 0
50
Oct. 0
50
Nov. 0
50
Ar. 0
50
130
120
110
100
90
80
70
60
Findlay
164.8 above
" be.
177.2
Lima above
" below
178.8
Defiance Maumee above
" "
Auglaize ab.
Maumee below
Jul.
Aug.
Sept.
Oct.
Nov.
Ar.
Plate 22
B. H. Flynn

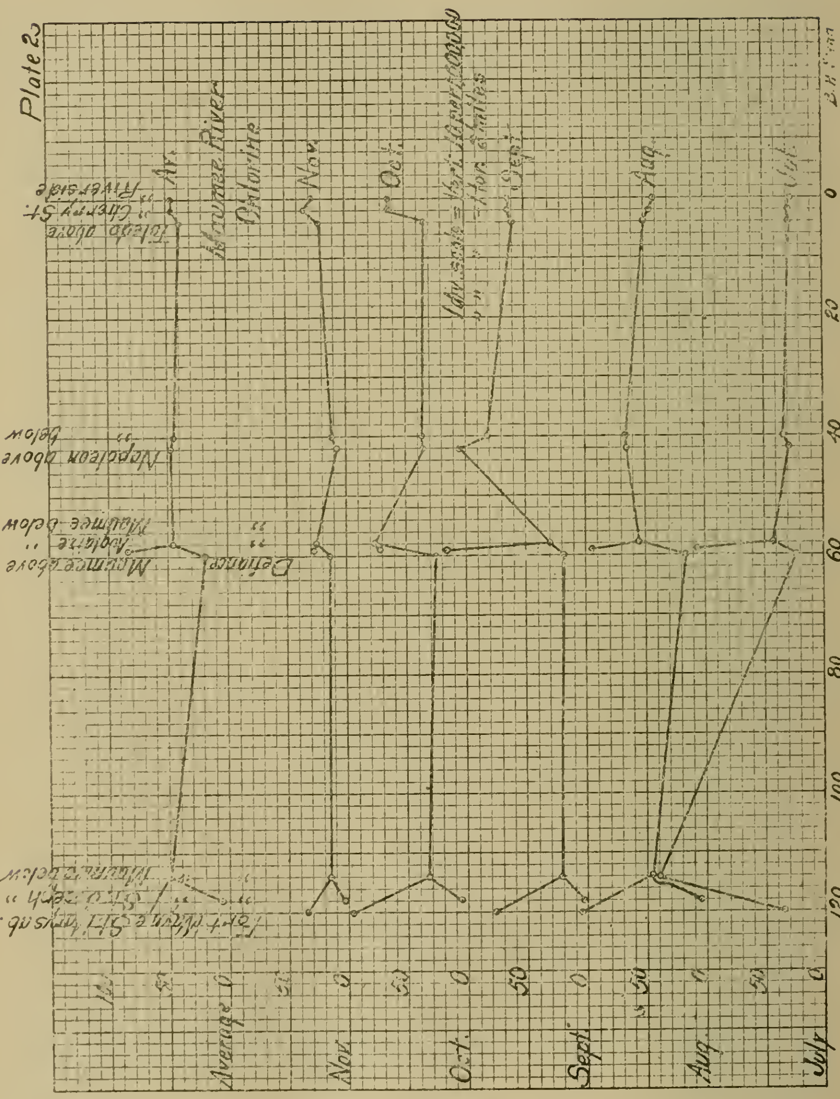


Plate 23
Maumee River
Chlorine
Toledo above Cherry St.
" Riverside
Av.
Nov.
Oct.
Sept.
Aug.
July
Napoleon above
" below
Maumee below
Antwerp "
Maumee above
Defiance "
Fort Wayne St. Marys ab.
" St. Joseph "
Maumee below
0
20
40
60
80
100
120
Average
0
50
100

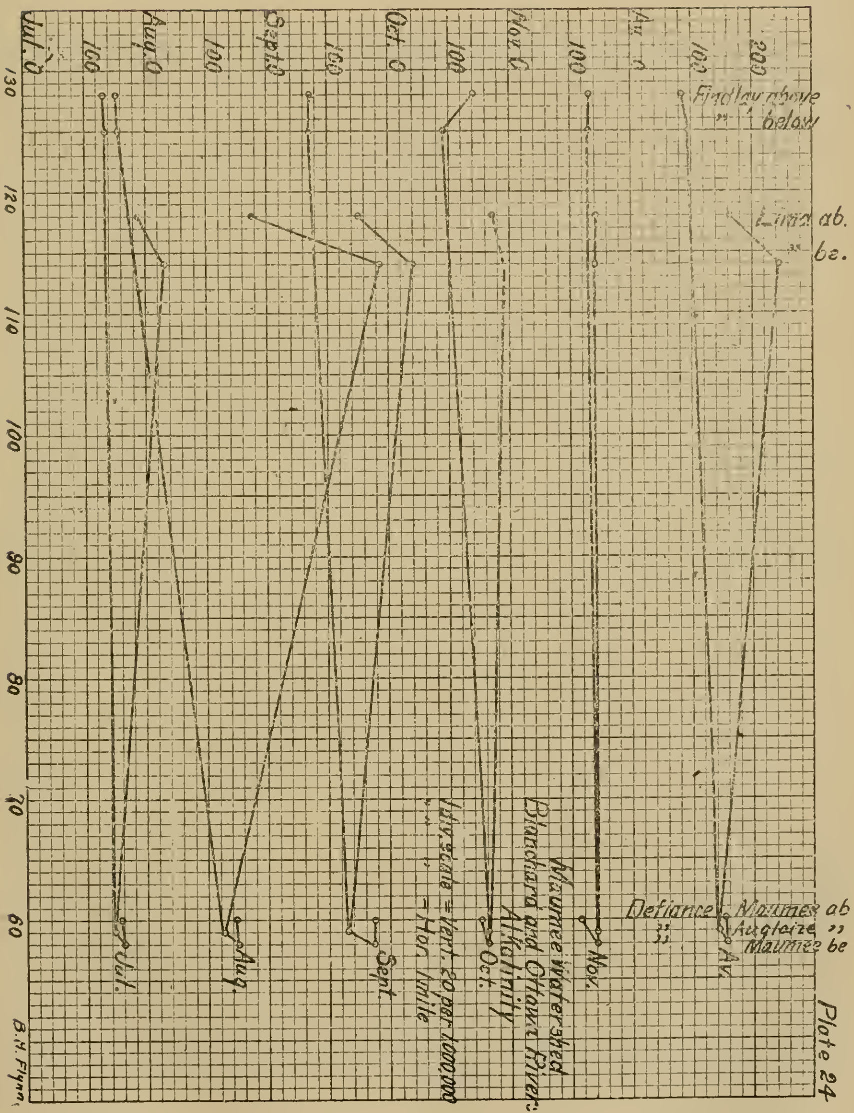

Jul. 0
100
Aug. 0
100
Sept. 0
100
Oct. 0
100
Nov. 0
100
Av. 0
100
200
Findlay above
" below
Lima ab.
" be.
130
120
110
100
90
80
70
60
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
Defiance
"
Maumee ab
Auglaize "
Maumee be
Maumee Watershed
Blanchard and Ottawa River.
Alkalinity
1 div. scale = vert. 20 per 1000,000
" " = Hor. 1 mile
B. M. Flynn

Plate 24

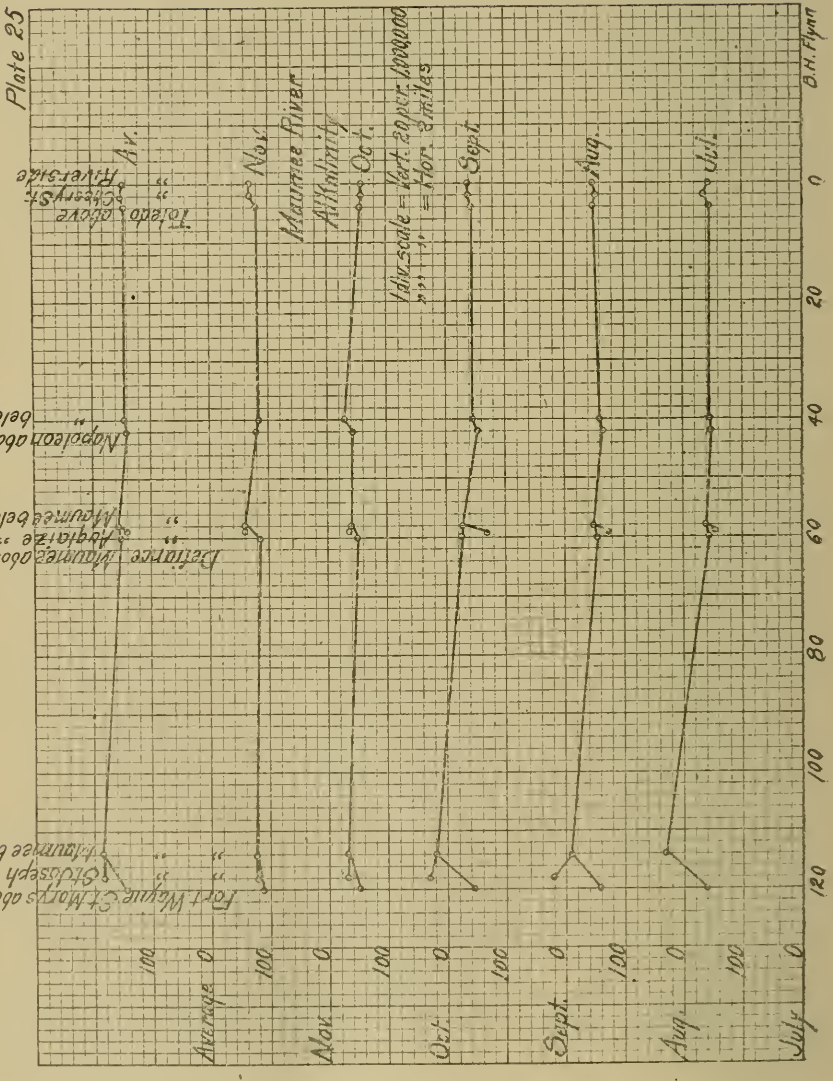


Plate 25
Maumee River
Alkalinity
1 div. scale = Vert. 20 per 1,000,000
" " = Hor. 2 miles
B.H. Flynn
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Toledo above Cherry St.
" Riverside
Napoleon above
" below
Defiance Maumee above
" Auglaize "
" Maumee below
Fort Wayne St. Marys above
" St. Joseph "
" Maumee below
0
20
40
60
80
100
120
Average 0 100
Nov. 0 100
Oct. 0 100
Sept. 0 100
Aug. 0 100
July 0

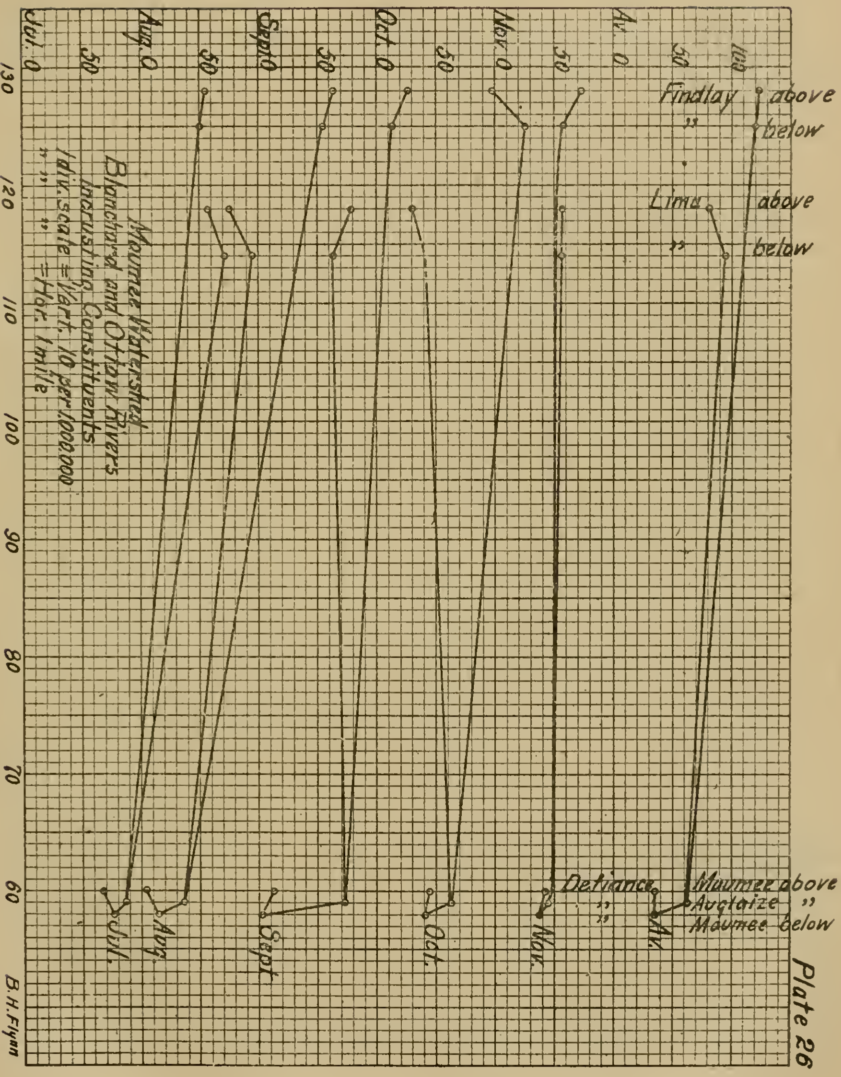

Maumee Watershed
Blanchard and Ottawa Rivers
Incrusting Constituents
1 div. scale = ½ Vert. 10 per 1000000
" " " = Hor. 1 mile
Jul. 0
50
Aug. 0
50
Sept 0
50
Oct. 0
50
Nov. 0
50
Av. 0
50
100
130
120
110
100
90
80
70
60
Findlay above
" below
Lima above
" below
Defiance
"
"
Maumee above
Auglaize "
Maumee below
Jul.
Aug.
Sept
Oct.
Nov.
Av.
B.H.Flynn

Plate 26

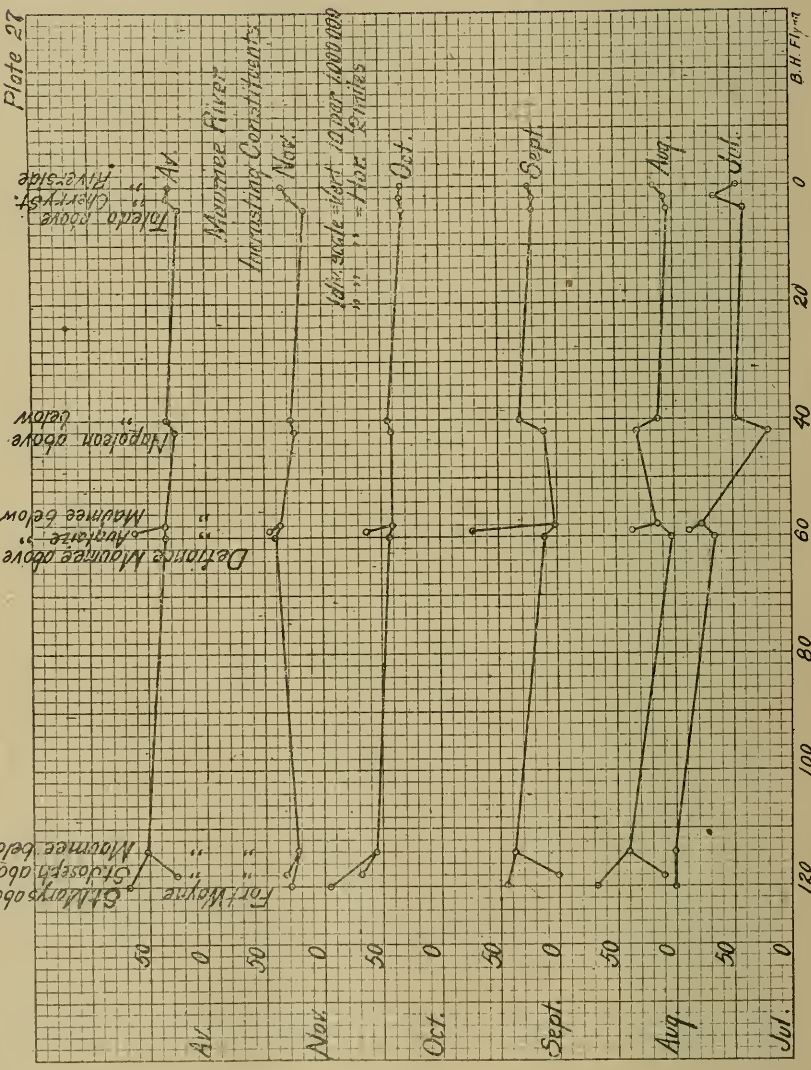


Plate 27
Maumee River
Incrusting Constituents
1 div. vert. scale = 10 per 1,000,000
" " Hor. " = 2 miles
Toledo above Cherry St.
" " Riverside
Napoleon above
" below
Defiance Maumee above
" Auglaize "
Maumee below
Fort Wayne St. Marys above
" St. Joseph above
" Maumee below
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
0
50
0
20
40
60
80
100
120
B.H. Flynn

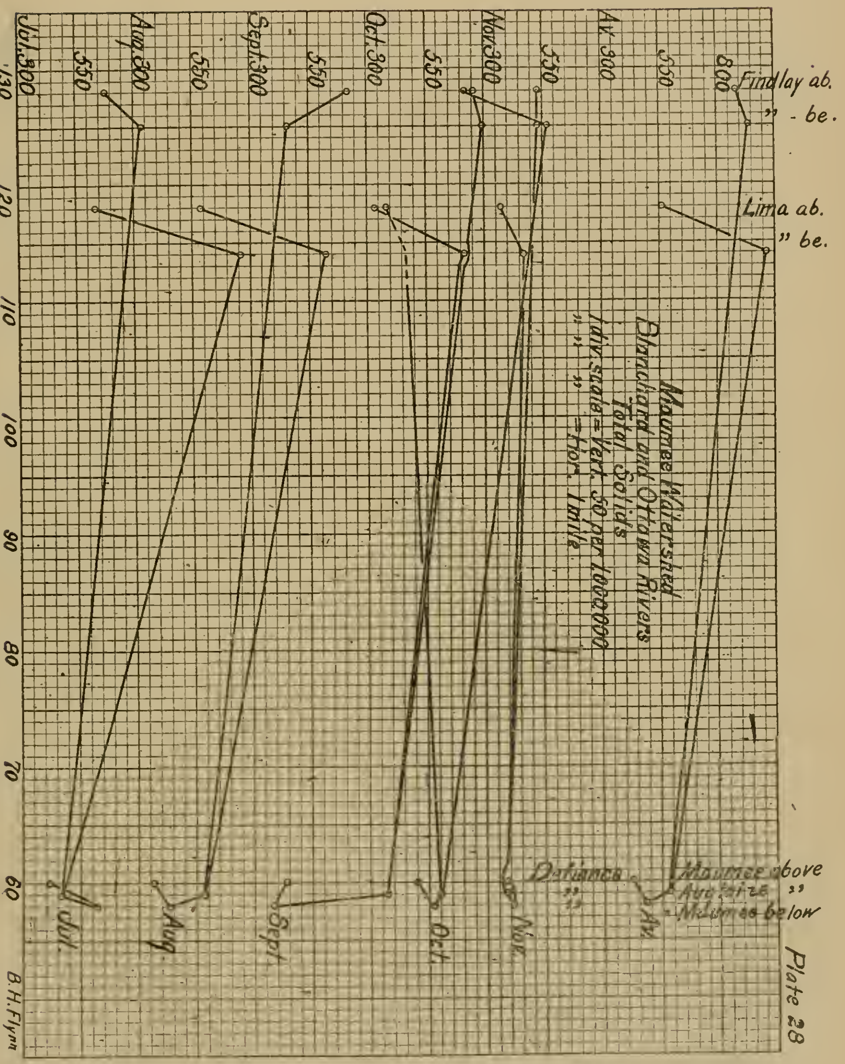

Maumee Watershed
Blanchard and Ottawa Rivers
Total Solids
1 div. scale = Vert. 50 per 1,000,000
" " " = Hor. 1 mile.
Jul. 300
550
Aug. 300
550
Sept. 300
550
Oct. 300
550
Nov. 300
550
Av. 300
550
800
Findlay ab.
" - be.
Lima ab.
" be.
Maumee above
Auglaize "
Maumee below
Defiance
"
"
130
120
110
100
90
80
70
60
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
B.H.Flynn

Plate 28

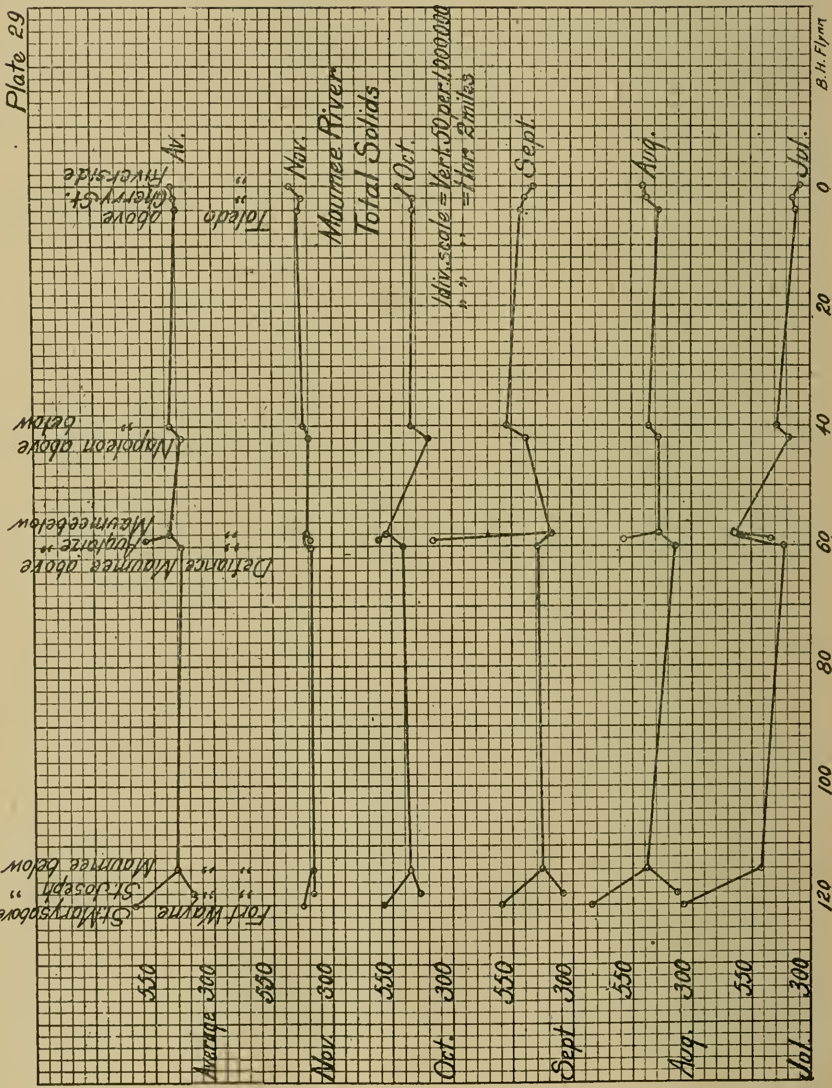
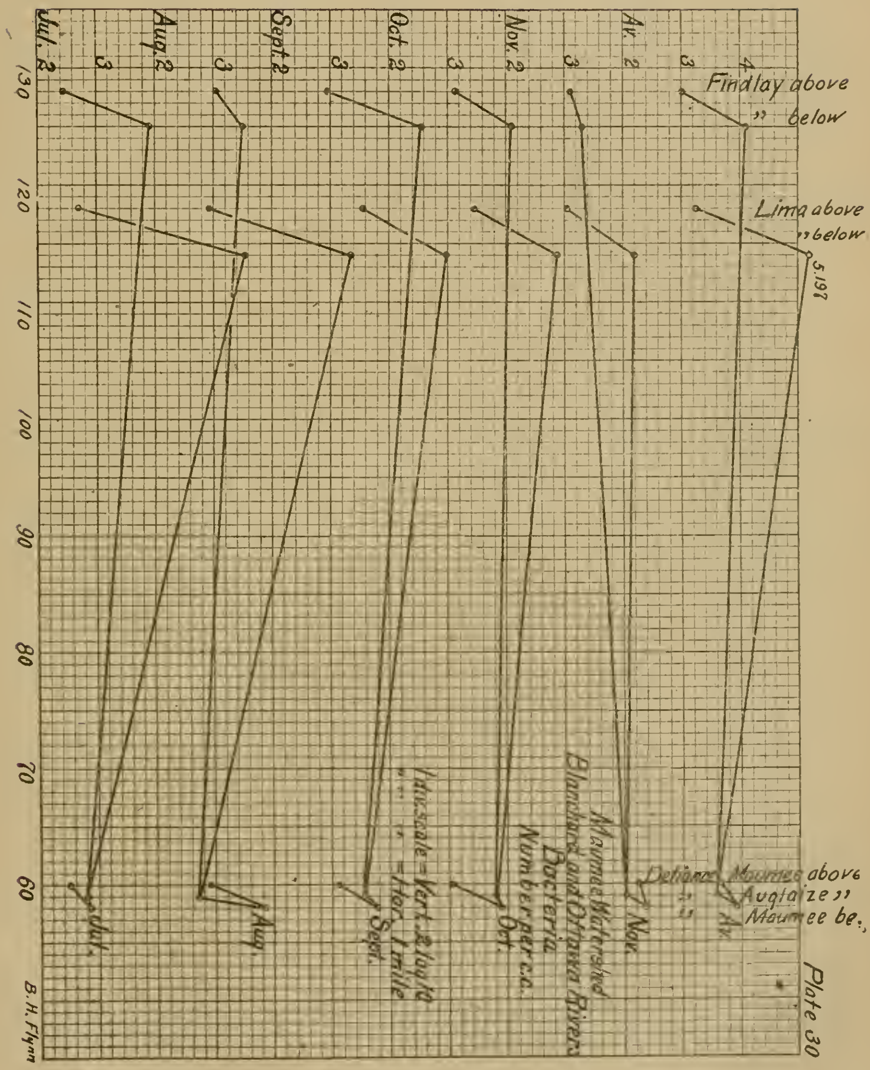


Plate 29
Maumee River
Total Solids
1 div. scale = Vert. 50 per 1,000,000
" " " = Hor. 2 miles
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Toledo above Cherry St.
" " Riverside
Napoleon above
" below
Defiance Maumee above
" " Auglaize
" " Maumee below
Fort Wayne St. Marys above
" " St. Joseph
" " Maumee below
0
20
40
60
80
100
120
Average 300 350
Nov. 300 350
Oct. 300 350
Sept. 300 350
Aug. 300 350
Jul. 300 350
B.H. Flynn


Jul. 2
3
Aug. 2
3
Sept. 2
3
Oct. 2
3
Nov. 2
3
Av. 2
3
4
Findlay above
" below
Lima above
" below
5.197
130
120
110
100
90
80
70
60
Defiance Maumee above
" Auglaize "
" Maumee be.
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
Maumee Watershed
Blanchard and Ottawa Rivers
Bacteria
Number per c.c.
Hor. scale = Vert. 2 log 10
" " = Hor. 1 mile
Plate 30
B. H. Flynn

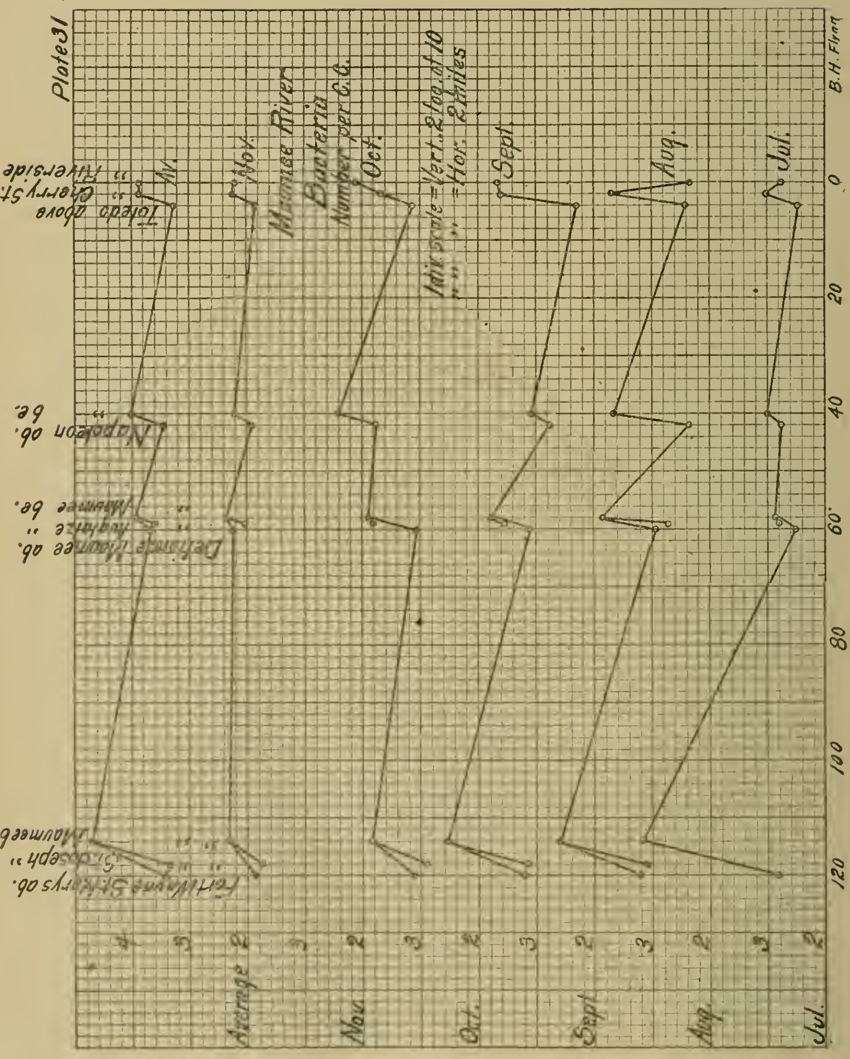


Plate31
Maumee River
Bacteria
Number per C.C.
Adir. scale = Vert. 2 log. of 10
" " = Hor. 2 Miles
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Toledo above
" Cherry St.
" Riverside
Napoleon ab.
" be.
Defiance Maumee ab.
" Auglaize "
" Maumee be.
Fort Wayne St. Marys ab.
" St. Joseph "
" Maumee b.
0
20
40
60
80
100
120
Average 2
3
4
Nov. 2
3
Oct. 2
3
Sept. 2
3
Aug. 2
3
Jul. 2
B.H. Flynn

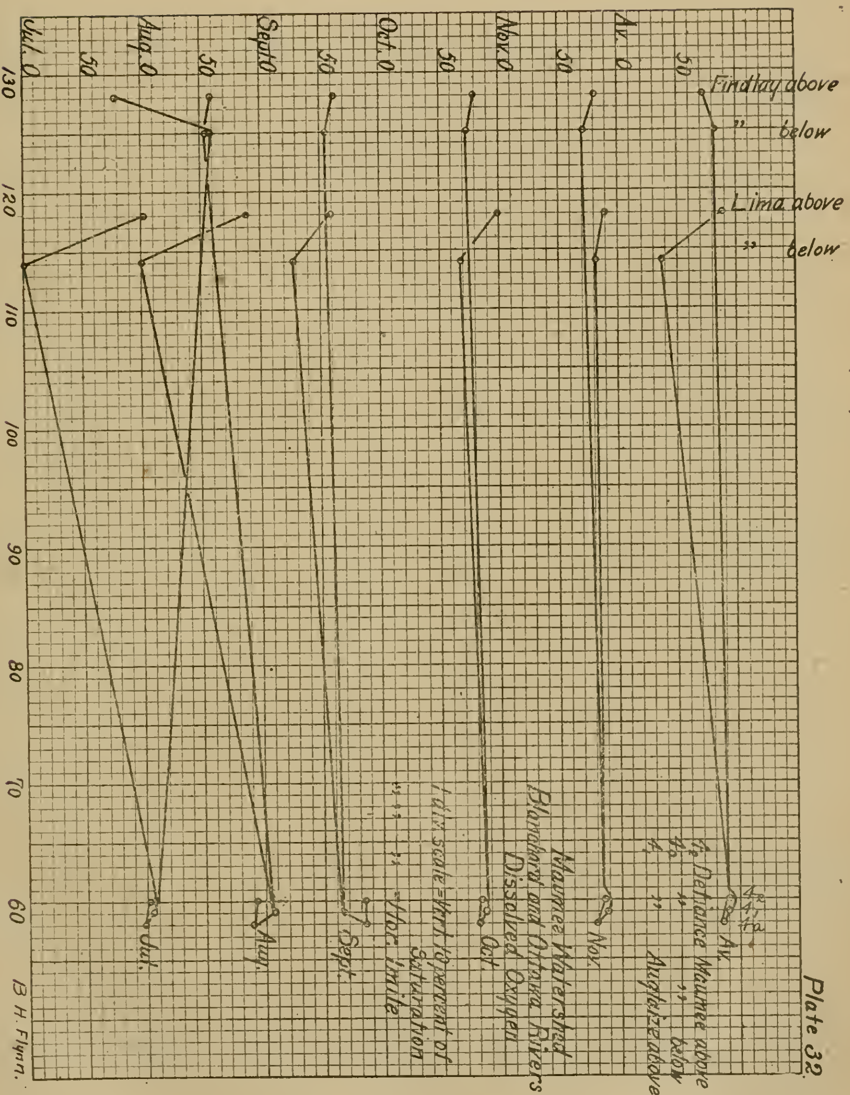


Plate 32.
Maumee Watershed
Blanchard and Ottawa Rivers
Dissolved Oxygen
Ordin. scale = Unit to percent of saturation
" " Hor. Unit
Findlay above
" below
Lima above
" below
4 Defiance Maumee above
4a " " below
4, " Auglaize above
Jul. 0
50
Aug. 0
50
Sept. 0
50
Oct. 0
50
Nov. 0
50
Av. 0
50
Jul.
Aug.
Sept.
Oct.
Nov.
Av.
130
120
110
100
90
80
70
60
B. H. Flynn.

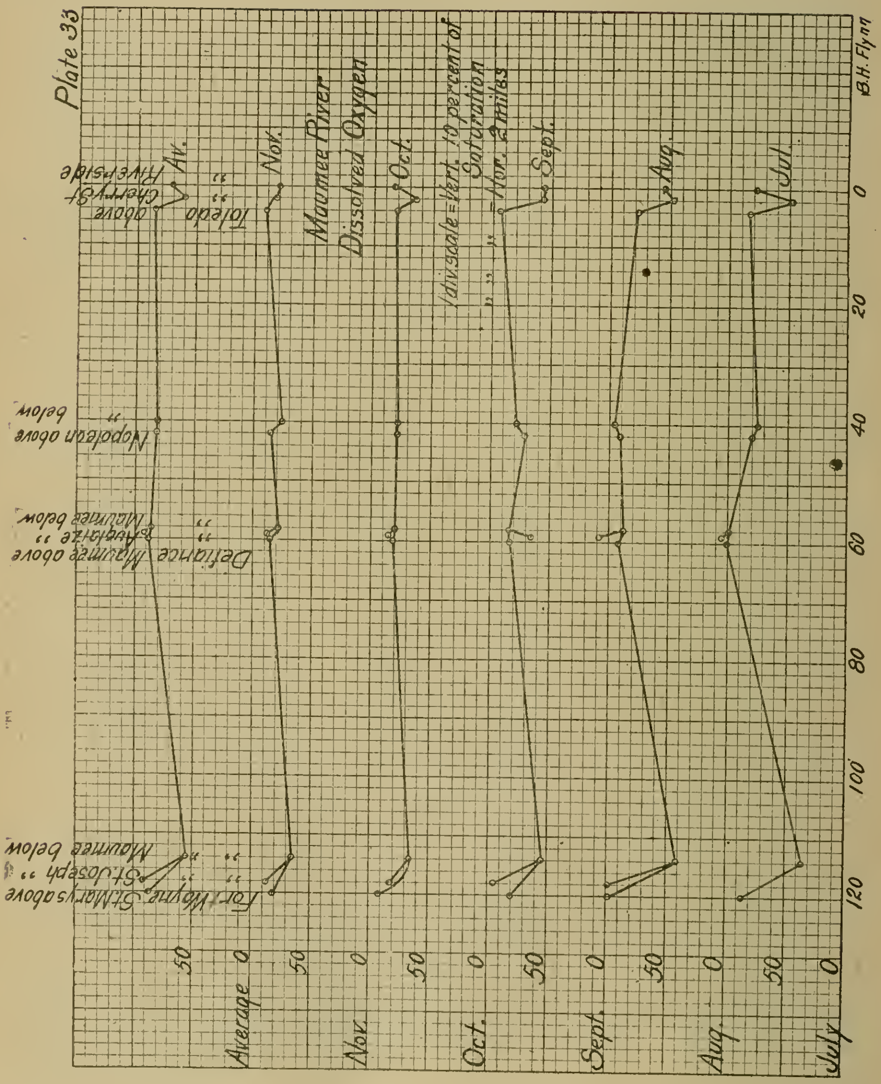


Plate 33
Maumee River
Dissolved Oxygen
1 div. scale = Vert. 10 percent of Saturation
" " " = Hor. 2 miles
Fort Wayne
St. Marys above
St. Joseph " "
Maumee below
Defiance
Maumee above
Auglaize " "
Maumee below
Napoleon above
" below
Toledo
above Cherry St.
" Riverside
Av.
Nov.
Oct.
Sept.
Aug.
Jul.
Average
Nov.
Oct.
Sept.
Aug.
July
0
50
0
20
40
60
80
100
120
B.H. Flynn

DISCUSSION OF TABLES AND PLATES.

SANDUSKY WATERSHED.

PHYSICAL CHARACTERS. The water of the Sandusky river shows considerable color which remains nearly uniform throughout the stream except below Crestline and Bucyrus, rising especially at these points in times of low water. The water of this stream, in 60 per cent. of the samples taken, gave a prominent urbidity mostly due to the suspended clay in a finely divided state. Clay is found quite abundantly along the course of the river. The sediment was slight except in times of high water or at the stations below Crestline and Bucyrus, where much pollution was present. The stream is not an odorless one—but five samples during the season yielding no odor, while many of the samples were undesirable, and some were bad. On the whole the odor of the water would frequently make it undesirable as a public water supply.

CHEMICAL CHARACTERS. *Oxygen required.* Here we find evidence of the presence of a large amount of organic matter for nowhere in the river do we find a low oxygen requirement, while the average of all the determinations is nearly 7½ parts to the million. The curves (Plate 1) show that in general there occurs, as would be expected, an increase in the oxygen requirement wherever organic pollution is found. This is especially noticeable at Crestline and Bucyrus where in the summer the stream is so small—a mere brook—that the sewage produces a marked effect. In connection with the fall of the November curve at Bucyrus, it should be borne in mind that the river had overflowed its banks to such an extent that the collector could not get within fifteen rods of the usual sampling place, and consequently took his sample at the edge of the greatly widened stream. A sample from the current would doubtless have yielded other results.

Nitrogen in the Form of Albuminoid Ammonia. It was found that the albuminoid and free ammonias were in this river subjected to fewer local disturbances than the other determinations and, accordingly, they are the best indicators of the sanitary condition of the water. The albuminoid ammonia curves (Plate 2) with striking regularity rise at known points of pollution and fall in the intervals by virtue of the processes of natural purification. It will be noticed that both the free and albuminoid ammonia curves fall but little (best shown in the curve of averages) from below Upper Sandusky to above Tiffin. This does not mean so much the lack of purification in that distance as lack of pollution at Upper Sandusky. By reference to Mr. Flynn's report it is seen that Upper Sandusky does not contribute so much sewage to the river as its population would lead one to think. The average amount of nitrogen occurring as ammonia is but slightly higher above Tiffin than above Upper Sandusky. The course of the November curve at Fremont is unexpected, but is similar to that of the oxygen requirement, whereas the curves for chlorine and free ammonia take the usual course at that time. The cause was undoubtedly a local vegetable pollution affecting the above Fremont sample. Such a pollution might readily occur under the weather conditions prevailing at the time.

The determinations of the *nitrogen in the form of free ammonia* with the resulting curves (Plate 3) are very satisfactory, and point out admirably the sewage pollution condition of the stream at the points where samples were taken. The curve rises with each addition of sewage and then falls until the sewage of the next lower town is received. The July sample below Upper Sandusky does not represent the full extent of the local pollution as it was taken, through lack of information, above the mouth of one of the sewers. The effect of rain in making the water more uniform as regards its free ammonia nitrogen is seen in the flat November curve and similarly, but to a less degree, in the August curve. By consulting the discussion of the weather conditions it will be seen that the November sampling was at flood time and the August sampling immediately after summer rains.

The wide fluctuations of the curves at Crestline and Bucyrus indicate here, as in other determinations, much pollution in little water. It is not to be thought in studying the July curves that the sudden drop from station 1*a* to 1*b* (Crestline two miles below to Crestline three miles below) is indicative of any such rapid purification in the short space of one mile as the curves might suggest. The result is due in great part to dilution. Station 1*a* was taken on what is locally and logically known as "Stink creek," a mere open sewer across which one could step in some places, but which carries the sewage of Crestline. Within the next mile, however, Stink creek is joined by two other streams resulting in a fairly respectable body of water at Station 1*b*, although but one mile from the former station.

Nitrogen as Nitrites and Nitrates. (Plates 4 and 5). The nitrites represent the intermediate stage between the ammonias and the nitrates whether the process be the oxidation of the ammonia to nitrates or the reduction of the nitric acid to ammonia. When organic matter has reached the form of nitrates it is in its least objectionable state, and is then frequently spoken of as the evidence of previous sewage contamination. However, the amount of nitrates in a river does not represent the full amount of previous contamination for some proportion of the nitrates would be taken up by growing vegetation. It will be seen by consulting the plates that nitrites are present below each known addition of sewage showing that oxidation of the organic matter had already begun, and in many cases we find oxidation had gone far enough to show an increase in the nitrates. Had our below town samples been taken closer to pollution, or had the stream been swift in its flow so as to have brought the pollution more quickly and consequently unchanged, to the below town stations, the nitrate curves would have been different. As it was the distance and the slow flow gave time for the oxidizing agents to produce an increase in the nitrates. Even in those places where the percentage of sewage was greatest we find this occurring. By consulting the report of Mr. Flynn it will be seen that below Crestline and below Bucyrus the exposed condition, the shallowness of the stream, the broken flow and the vegetation furnish conditions favorable to oxidation. In connection with the exceedingly high amounts of nitrous and nitric acid at Crestline in July, we would call attention to the fact that the free ammonia is lower. Owing to the dry weather conditions in that month the stream was unusually low, and the flow was very slight. The influence of the fall rains in making the water of the stream richer in nitrates is not so noticeable in the Sandusky river as in the Maumee and those examined last year. The nitrate determinations for November are, however, somewhat higher than during the rest of the season.

Chlorine. (Plate 6). As the amount of chlorine in the water changes only by the addition of more chlorine or by dilution of the water, its determination is one of those most sought as an indicator of sewage pollution. This value as an indicator depends, however, on the absence of chlorine from mineral sources, and accordingly the presence of mineral chlorine makes this determination an unreliable one in establishing the presence or absence of sewage pollution. In a river free from mineral chlorine the curve would by rising point to each sewage pollution, and by falling show the addition of water containing a less amount of chlorine. The water of the Sandusky river is high in chlorine throughout its course. The effect of dilution is seen in the November samples when all of the results were much lower, and the various samples differed less from each other as shown by the smoother curve. The curves show an increase of chlorine for the addition of sewage except once at Bucyrus, once at Upper Sandusky, and three times at Tiffin. The cause for the direction of the curve at Bucyrus in September is not apparent. We would mention in this connection that although the rainfall table gives no precipitation for the two days preceding the taking of the September samples at Bucyrus, nevertheless the field note book of the writer says he was informed when taking the samples that quite a rain had fallen on the two days previous. The roily condition of the water sustained the information thus recorded. The cause for a similar decrease in the chlorine at Upper Sandusky in October is likewise not apparent but there must have been some dilution associated with the lower sample, or too high a figure above town resulting from some local pollution. It was learned at the close of the season that there is a spring in the bed of the river near the sampling point below Tiffin. The influence of such a fresh water source could easily lower the chlorine character of a sample taken near it, but why this should have occurred in three out of five samples and not in the others does not seem clear.

Perhaps the most striking thing in Plate 6 is the great increase of chlorine between Upper Sandusky and Tiffin. This occurred each month save August, and is well shown in the curve of averages. Between the two places named the Sandusky river receives the waters of Honey, Sycamore and Tymochtee creeks. As these tributaries receive little or no sewage, and as their combined volume approximates that of the Sandusky, we would expect a decided lowering of the amount of chlorine to be shown above Tiffin. This actually occurred only in August, and then the chlorine appeared again at Fremont. This chlorine is not of sewage origin. After a personal inspection of the river between Upper Sandusky and Tiffin, the civil engineer of the State Board of Health says there is no sewage pollution to account for such an increase in chlorine. Furthermore, a study of the analytical results and plates shows this increase of chlorine to be unaccompanied by any corresponding increase in organic matter, with the exception, possibly, of November when the high water would result in diluting the chlorine, and increasing the organic matter. But one conclusion can be reached—this increase is due to chlorine of mineral origin and enters the river between Upper Sandusky and Tiffin. The exact location of this pollution was not attempted by analytical methods, and failed to be attained by inquiry and inspection. No oil wells are present in that territory, and no salt springs could be located although rumor were heard of "deer-licks" in years gone by. This rise in chlorine is greatest in July and October, when the samples represented the river under dry weather conditions, or just at the beginning of a rain, and is much less under the influence of the rains in August, September and November. It will be seen that the river maintains this high chlorine throughout its succeeding course—station 6 representing Sandusky bay water and not the river water. It would seem from the August curve that the addition of this extra chlorine had been made between Tiffin and Fremont, but a study of the results for the other months gives no indication of chlorine pollution between Tiffin and Fremont. The peculiar August results finds a more probable explanation in the effect of the heavy rain which fell from 48 to 72 hours before the samples were taken at Tiffin, and which may have washed the chlorine past Tiffin, and yet not have had time to wash it past Fremont. This explanation finds support in the reverse condition of the curve in October, when the samples were taken so soon after a rainfall that the effect of the washing appeared only at Tiffin, not having had time to reach Fremont. This explanation of the peculiar features of the August and October curves rests in part upon the following assumption. The chlorine as it is about to enter the river gathers to some extent in such shape as to be partially held back until washed out under the influence of a sudden rain. In November the river was higher and no such result would appear. The source of this chlorine pollution may be intermitent, but it does not appear from the data at hand.

The *alkalinity*, (Plate 7), gives approximately the amounts of calcium and magnesium carbonates. The curve of the averages shows the carbonates were fairly uniform throughout the stream, with the exception that they are higher below Crestline. At that station the alkalinity was low for some cause in September, and again in November. In the latter month the stream was full from fall rains and this addition of rain water would naturally lower the results. The sewage and other pollutions of the towns and cities increase the carbonates as seen best from the curve for the averages. This effect is greatest at Crestline where the sewage is but little diluted. The Sandusky river water is richer in carbonates than the Mahoning, though not so rich as that of the Scioto and Olentangy rivers, while it is nearly the same as the Maumee water.

Incrusting Constituents. (Plate 8). As stated before these are chiefly sulphates and chlorides of calcium and magnesium and are the formers of the scale found in boilers. The curve of averages is quite regular and shows, like the alkalinity, an increase on the addition of the city pollutions. This means that the sewage of the various places along the stream is harder than the river water itself. The water of the river is hardest at Upper Sandusky and Tiffin, although there is but a slight decrease for Fremont.

The *total solids* (Plate 9), follow in general the alkalinity and incrusting constituents, and also show the presence of the alkaline salts at Crestline, Tiffin and Fremont.

Dissolved Oxygen. (Plate 11). In the work upon the Scioto and Olentangy rivers last year, several samples of water were found containing a greater amount of oxygen than is given by tables as the amount which distilled water takes up when saturated with air. The results were obtained with care and duplicated. We anticipated the same feature in the present work, and accordingly desired to carefully examine the water biologically at those places where supersaturation appeared in the Sandusky and Maumee watersheds, but the stress of the regular routine work prevented any added investigations along other lines. This supersaturation is no doubt due to the oxygen given off in plant growth, as stated by Prof. Lord in his report upon the Scioto and Olentangy rivers. Out of 52 samples from the Sandusky river there were six cases of supersaturation. One was above Crestline in October, but as this was the only sample taken there except in the high water, November, it gives us little information of the normal condition. In September both the Tiffin samples showed supersaturation. The remaining three cases were above Bucyrus in the three summer months.

We expect the decrease in the amount of dissolved oxygen whenever sewage is added to the stream. With one or two exceptions that is what occurred, as may be seen from Plate 11. This is a natural sequence, as the purification of sewage is a process of oxidation, and the free oxygen in the water is quickly taken up by the organic matter so prevalent in sewage.

BACTERIAL FINDINGS ON SANDUSKY WATERSHED.

	July.	August.	September.	October.	November.	Average.
Crestline, above	....	....	....	1,160	58,500	29,830
Crestline, below	65,350	30,210	46,800	18,095	222,300	76,551
Bucyrus, above	345	775	735	200	82,800	16,971
Bucyrus, below	295,800	29,260	24,070	5,381	175,000	105,902
Upper Sandusky, above	167	677	1,300	585	13,100	3,166
Upper Sandusky, below	610	8,440	40,320	5.070	31,900	17.268
Tiffin, above	133	1,590	820	1,155	16,980	4,134
Tiffin, below	5,700	9,720	4,140	37,400	53,000	21,992
Fremont, above	330	1,319	675	1,455	4,490	1,654
Fremont, below	4,725	11,060	4,730	11,400	5,060	7,395

Bacteria. (Plate 10). Without exception the bacterial curve rises under the influence of fresh sewage and falls again with conditions of natural purification. The intensity of the inflections agrees well with the degree of pollution. The greatest amplitude of the curve being at Crestline and Bucyrus during the stages of low water. This confirms the chemical findings. As stated in the previous report by Dr. Bleile, a sudden rain would bring into the river large numbers of bacteria in the surface washings, together with more or less organic matter suitable for their nourishment and subsequent propagation. This would result in an increase in the number of bacteria in the purer portions of the stream, while it would dilute the more badly polluted portions. With an increase of bacteria in the purer water and a decrease in the impurer water, as a result of recent rainfalls, a smoother curve would be obtained. This is shown in November and, to a less degree, in August. The November figures are misleading if they be taken as representative of the conditions throughout the month. No doubt the number of bacteria would be higher then as shown by the findings of other workers, but not as high as the figures here given for November. By reference to the dates of sampling and to the rainfall table it will be seen that the samples for that month were taken at flood time, and at the beginning of the sudden high water, when the bacterial effect of surface washings would be greatest. These extreme conditions would not long continue, and thus it is unfair to take the November figures, as representing the conditions for that month, in the same way as the other findings do for their months. Consequently the averages given in the table, although they do represent the mean number of bacteria in the five examinations should not be taken unconditionally as a basis for judging the water. On the other hand an average of the findings for July, August, September and October does represent the number of bacteria present under average conditions during that season of the year. A correct average for the season would be somewhere between the two averages.

The waters recently polluted are not the ones likely to be used, and so we will confine our inquiries to the purity of the water at above town stations, where the river would be expected to be at its best. The extreme effect of the November samples, as spoken of above, is strikingly shown in the following table of averages at the above town stations:

	Crestline.	Bucyrus.	Upper Sandusky.	Tiffin.	Fremont
	a	a	a	a	a
Average for season.... .	29,830	16,971	3,166	4,134	1,654
Average omitting Nov..	1,160	514	682	924	945

But little value can be placed on the findings above Crestline, owing to unusual conditions in the only two months when there was sufficient water to cause a flow. In October the water had just begun to flow and would be higher bacterially than a water which had been regularly washing the bed of the river for some time. In November occurred the very high water conditions previously referred to. For these reasons we omit the station above Crestline, and speak of the four remaining ones. Beginning with Bucyrus above, we have an average of 514 bacteria per

c. c., with a steady increase at each successive station down the river. This increase is not large, but it would indicate that the water is being polluted faster than it purifies itself. There is little satisfaction in trying to establish a bacterial normal for this river with the information at hand. The October and November conditions above Crestline have been stated, and during the remaining months our uppermost sample contained Crestline sewage. The lowest results were obtained in July when the water was lowest, and were equaled but once during the remainder of the season, viz., above Bucyrus in October. By reference to Mr. Flynn's report it will be seen that while Tiffin is a thriving city of some 14,000 population, yet only 2,700 of these have access to sewer connections, and accordingly the pollution of the river is not as great as one might at first think from the size of the city. In addition to this there is a milldam one mile above our below-Tiffin station, and between it and the city. Again our sampling point was just above a second dam. These dams, by backing the water, furnish opportunities for sedimentation and thus would decrease the otherwise greater increase in bacteria below Tiffin. The results of the bacterial and chemical analyses indicate, that while the water of the Sandusky river may at times purify itself under favorable conditions, yet in general the pollution exceeds, to a greater or less degree, the amount of purification taking place by natural processes.

MAUMEE WATERSHED.

It is well before discussing the results to speak of certain disturbing factors. Oil wells are to be found in several parts of this watershed and the deep ground water they pump out is frequently saline. At Findlay are situated two factories for the manufacture of nitro-glycerine, and the wastes from these factories enter the Blanchard river—the outlet from one factory being above the upper station at Findlay and the other between the two stations. The writer is informed that the lower factory was in constant operation and the upper one nearly so. At Toledo boats of various sizes are passing back and forth with irregularity—especially is this true at Cherry street, and at Riverside Park. When one of the larger boats passes, the water is greatly stirred up, even at times bringing to the surface fragments of the nasty mud found at the bottom of the river. On both sides of the river at this place are manufacturing plants of various kinds. The uncertainty of obtaining samples which would truly represent the river under these conditions is so great that we shall not attempt to explain some of the irregularities to be found in the results at Toledo.

PHYSICAL CHARACTERS. The color of the Maumee river water, especially in its lower course, is slightly less than that of the Sandusky. The Ottawa and Blanchard tributaries are quite highly colored at Lima and Findlay—this being increased in times of low water. The turbidity of the Maumee is similar to and slightly greater than that of the Sandusky. The slow current is favorable to sedimentation and but little sediment is found, except in high water. The volume of the Maumee would lead us to expect but little odor from specific pollutions, and yet the water falls short of a desirable one in this respect. At times the samples from Findlay, Lima and Ft. Wayne yielded extremely objectionable odors. In but one of the five samples above Findlay was the water odorless and three times this feature was such as to make the water unpalatable.

CHEMICAL CHARACTERS. The *oxygen requirement* (Plates 12 and 13) is even higher in this river than in the one previously discussed and is of little, if any, value in determining sewage pollution. In the lower portion of their courses where the waters run more uniform in their oxygen requirement the Maumee determinations ran about two parts to the million higher than did those of the Sandusky. The excessive increase in the oxygen required at Lima in July, August and September was due to the fact that the stream below town was mainly composed of sewage and the washings from the strawboard mill. Much of the oxygen required was due to the latter element, as is shown by comparing Plates 12 and 14; for had it been due to sewage the albuminoid ammonia would also have been higher. The comparison shows the vegetable pollution to be carbonaceous rather than nitrogenous in character. The October sample was unfortunately lost by the bottle being broken in transit. In November the condition was changed; the stream was full from the fall rains and while increasing the oxygen requirement at other places by virtue of the vegetable matter washed in by the rains, yet it served to dilute, below Lima, the water already high in required oxygen. The long flow of more than fifty miles to the Defiance station on the Auglaize river furnishes opportunity for change and we find at the latter station this requirement, except in September, to be approximately as low as the Maumee at that place. A very severe rain and wind storm occurred September 24, on the area drained by the Ottawa river, and its effect is seen in the high figures for that month above Lima and below Defiance on the Auglaize. While showing an increase at those places due to the vegetable matter washed in, yet the otherwise high oxygen requirement below Lima would be lowered by this dilution, as stated before. A comparison of the conditions above Defiance in October and November on Plates 12 and 14 show by the oxygen required and the nitrogen as albuminoid ammonia that, when both streams are full from uniform wet conditions, the Maumee comes down to Defiance with a greater vegetable pollution than does the Auglaize. This is compatible with the fact that acres of the upper Maumee watershed are covered with remains of vegetation as shown by the report of the engineer, and under continued wet weather this could produce the above results. The descent of the curve at Napoleon in November is unexpected, but seems to be in some way associated with the high waters. The averaging of results at Defiance includes the effect of Tiffin river, which enters the Maumee just below the upper station at Defiance.

Nitrogen as Albuminoid and Free Ammonia. (Plates 14–17). As in the case of the Sandusky river these determinations were interfered with by disturbing local factors and accordingly may be taken as the most reliable indicators of the extent of sewage pollution. The two sets of curves are quite similar, month by month, and, except in one or two instances, agree closely with the known pollution. In November the amount of free ammonia below Defiance is nearly a mean of the amounts above that city on the Auglaize and on the Maumee. This would be a natural sequence without the sewage of Defiance, as the volumes of the two streams are nearly equal. In the absence of information from gagings we estimate the relative volumes of the two streams by the area drained.

The Auglaize drains 2,504 square miles and the Maumee above Defiance, approximately, 2,230 square miles. It should not be overlooked that the Tiffin river, with a drainage area of 669 square miles, empties into the Maumee just below the upper station at Defiance. As shown by the report of Mr. Flynn the pollution of this river is slight and at such a distance that the water would be well purified by the time it reaches the Maumee and consequently offset, to a considerable degree, the pollution from the city of Defiance. In fact the results show that in November when the streams were high there was a small decrease in the albuminoid ammonia at the station below Defiance. The marked inflections of the free ammonia curves (Plates 16–17) show the addition of considerable quantities of fresh sewage at Findlay, Lima, Ft. Wayne and Toledo. The usual effect upon the free ammonia in rivers at time of high water is seen in the smoother November curve. The condition at Findlay is an interesting one being the result of several complications. One might think from the chlorine and nitrogen determinations that an excessive sewage pollution had occurred above Findlay, but this is not the case. Mr. Flynn's report shows the only towns on the Blanchard river above Findlay are Forest and Dunkirk, and neither of these small places empty sewage into the river. Consequently the high results must be due to other causes. The chlorine, as will be shown later, is mineral in origin and is introduced by the salt water from the oil wells. The nitrogen as nitrites and nitrates is due to the washings from the nitro-glycerine factories. Some of the free ammonia may be due to the reduction of the nitrous and nitric acid by iron, if the acid comes in contact with iron pipes. Volume II, Geological Survey of Ohio, page 353, says that there are in Hardin county three marshes of a somewhat peaty nature, covering some forty thousand acres. One of these, Cranberry marsh, drains to the Blanchard river, and its natural drainage was made more effective by ditching at the time our examinations were made. This peaty water would account for the albuminoid ammonia. A portion of the organic matter would be decomposed and yield free ammonia. This accounts for the excess of nitrogen as ammonia. The further discussion of this triple pollution of salt, peaty water and acid will appear under the next two headings.

Nitrogen as Nitrites and Nitrates. (Plates 18–21). The increase in nitrous acid at the known places of sewage pollution is well shown. The great increase of nitric acid throughout the stream in November agrees with the results obtained last year on the Scioto and Olentangy rivers. The cold and wet weather had resulted in cessation of plant growth and in much soil washing, and thus the water was unusually rich in nitrates. We would say that while the figures and the curve for the averages show the average of the five samples for each place, yet it should not be assumed that these figures represent the average condition of the water during the five months the river was under consideration. On the contrary, the figures for the averages are misleading, as they are too high, due to the special November conditions. The samples of that month were taken at flood time just after the heavy fall rains. The nitrates are greatly increased after the sudden rise by virtue of the soil washings, and would soon decrease even though the water remained high. Accordingly the conditions at the time of the November sampling were favorable to an unusually high proportion of nitrates, probably seldom equalled during the season, and then for a limited number of days only. Consequently to take the high results of a limited period as representing the condition for the month would be unfair, and would yield too high a figure in averaging results with other determinations which do more properly represent the character of the water throughout their months. A very striking thing in these curves is the variation at Findlay. (Plates 18 and 20). Only in the month of July do the amounts of nitrogen in the form of nitrites and nitrates remain low enough above Findlay to be at all desirable, while the averages for the season are:

	N. as nitrites.	N. as nitrates.
Above Findlay	.056	9.505
Below "	.102	8 384

These high figures result from the waste washings from the nitro-glycerine factories. In the process of manufacturing nitro-glycerine acids are used and subsequently the product is washed to free it from superfluous acid. Thus a considerable amount of acid reaches the Blanchard river. The writer is informed that the dead vegetation along the sewer ditch outlet from the upper factory shows the characteristic effect produced by acid. In this sewer ditch the refuse from the factory gathers in pools to be washed out in times of rain. This may account for the lower results in July, as we are informed that the factories are in operation nearly if not all the time. From the rainfall table it will be seen that no rain had fallen on the four days preceding the July sampling, and less than one-half inch in twelve days. The samples of the remaining four months were taken as follows: August, within 24 hours after a precipiation of 1.07 inches; September, two days after a light rain which was preceded 48 hours by a rainfall of nearly one inch; October, after a series of rains; November, after a period of excessive precipitation yielding full streams for some time. From the weather conditions and the nature of the ditch we would expect high nitrites and nitrates in our August, September and October samples, with somewhat lower results in November and still lower ones in July. That is just what did occur. The low figures in July may have been in part helped by the following circumstance: Although no rain fell at Findlay on July 20, the field note book of the writer states that under date of July 21, he was informed when taking the sample that "there was a heavy rain up the river yesterday and the river rose eight inches." This heavy rain up stream and yet not at Findlay would, by increasing the amount of water in the river without increasing the pollution from the glycerine factory's ditch, yield lower amounts of nitrogen above town in July.

Chlorine. A good introduction to the study of this phase of the Maumee watershed may be found in last year's report on the Examination of Sources of Public Water Supplies, pages 192–197. From Dr. Orton's description of the mineral character of the water produced by the oil and gas wells found on so large a part of the area drained by the Maumee river, we are not surprised when we note the high chlorine findings and the irregular curves. These findings are worthless as indicators of the sewage pollution of the stream under consideration. It takes but a very brief comparison of the analytical results and the curves for chlorine and free ammonia to see that they do not agree as they should under ordinary circumstances. While it is true that the chlorine curves in general show an increase at the points of known sewage pollution, yet the absolute amounts are so high as to frequently exceed the chlorine possibilities of sewage. The figures given for London sewage are 150.

parts per 1,000,000, while the water above Findlay in September yielded 449.5 parts of chlorine. This amount is not so surprising when we remember that oil wells sometimes throw out brine in their pumpings, and that there are possibly 15 oil wells above Findlay. With such saline conditions at the city last named, at Lima, and as the engineer reports at the head-waters of the Auglaize river, it is not strange that the river named comes down to its junction with the Maumee so highly charged with chlorine that a great drop occurs regularly in the curve below Defiance as a consequence of the dilution by the water of the Maumee proper and more particularly of its northern tributaries. The effect of salt is found in four of the five branches of the Maumee examined—the only one showing an approximately normal amount being the St. Joseph river. This stream yielded an average of 3.6 parts of chlorine per 1,000,000, which could almost be expected from the population on the area it drained. On the other hand the population on the St. Mary could not by natural processes yield an average chlorine of 69.3 parts per 1,000,000. This amount is again unquestionably of a mineral character. As the results must therefore be more or less uncertain no further discussion of this factor will be made except of the condition at Lima. The findings at this place show mineral pollution both below and above town, especially so at the latter place in September. The regular and great increase shown below Lima should not be ascribed entirely to the influence of the sewage of that city. It seems that the public water supply of Lima contains more or less sodium chloride. In December, 1898, a request came to the State Board of Health for an examination of the public water supply of Lima. An examination made on December 16 revealed 1067. parts of chlorine per 1,000,000. No doubt it was unusually high at this time, but this would indicate the possibility of the presence of salt at all times. If a water as it is delivered to the consumers of a city be high in sodium chloride, we must find the water as it leaves the city, also high in the same ingredient, or there would soon be a people giving evidence of being descendants not of Adam, but of Lot's wife.

Aklalinity and Incrusting Constituents. (Plates 24–27). As stated previously the alkalinity is due chiefly to the carbonates of calcium and magnesium, while the chlorides and sulphates of calcium and magnesium furnish the incrusting constituents. The alkalinity represents temporary and the incrusting constituents permanent hardness. The Maumee is a little richer in carbonates and a little poorer in sulphates than the Sandusky river thereby differing from it but little in hardness. These streams have softer water than the Scioto and Olentangy but harder than the Mahoning. The water of the Maumee is hard as would be expected from the dolomite and limestone of the watershed. The deep waters of this region are very rich in mineral matter as shown by last year's report. Due to the addition of water of this character we find an increased hardness in the Auglaize, Ottawa, and St. Mary tributaries. The water becomes softer in the lower course of the Maumee. As the streams reach Defiance the Auglaize water is harder than the Maumee, due to the larger proportion of sulphates and chlorides in the former stream. The sewage of the various towns and cities is harder than the river water. This is best shown at Ft. Wayne and Lima, and both of these cities are supplied with hard waters. The greatest alkalinity was found at Lima where the scale-forming elements are also high. The lowest average alkalinities were at the two Findlay stations, and in turn we found there the two highest average incrusting constituents. This is in accordance with the expected from the addition of the acid refuse from the nitro-glycerine factories. By reference to plates (24 and 26) or to the tables, it will be seen that free acid was present in the water both above and below Findlay, giving a negative alkalinity in August. It was in this month that the incrusting constituents here reached their maximum. It will be remembered that at the time of taking our August, Findlay samples, a heavy rain had fallen within the preceding twenty-four hours, thus favoring a decided influence upon the samples by the washing out of the acid from the ditch where it had gathered in pools. In this connection see pages 356 and 360.

The *total solids*, (Plates 28, 29), are high from the mineral character of the water, and follow very well the hardness as shown by the combined alkalinity and incrusting constituents. However, in making a comparison between these and the total solids, the chlorine character of the Maumee watershed should not be overlooked. The chlorides of calcium and magnesium would appear in the incrusting constituents while sodium chloride would not, yet all would show in the determination for chlorine and total solids. For example the high total solids above Findlay in September greatly exceed the combined alkalinity and incrusting constituents, and are largely due to the sodium chloride present. The same feature is shown in the results below Lima in July, August and September. Again the alkaline salts account for the fact that while the average hardness of the Maumee is less than that of the Scioto or Olentangy rivers, yet the former stream slightly exceeds each of the others in the average total solids.

Dissolved Oxygen. As the free oxygen in a water readily unites with the free ammonia of sewage in the process of oxidation, therefore we should expect the dissolved oxygen to show a drop for each addition of sewage. Plates 32 and 33 show this. In the curve for the averages, Findlay alone fails to show a decrease for the addition of sewage, but this is due to the high supersaturation which from some unknown cause appeared below Findlay in July. The remaining four curves each show a decrease in the dissolved oxygen due to the sewage of that city. The month showing the increase is the one with the lowest free ammonia below town except November. The remaining supersaturations were, we believe, due to plant growth and were found above Lima, Defiance on the Maumee, and Defiance on the Auglaize in July, and again at the last named station in August. The lowest averages were at Lima, Ft. Wayne and Toledo where the worst sewage pollutions occurred.

BACTERIAL FINDINGS ON MAUMEE WATERSHED.

	July.	August.	September.	October.	November.	Average.
Findlay, above	292	1,110	930	1,436	1,285	1,011
Findlay, below	7,790	3,370	34,960	13,050	1,900	12,214
Lima, above	497	895	3,450	2,910	1,130	1,776
Lima, below	371,300	227,800	94,620	76,760	15,760	157,248
Defiance (Auglaize) above	615	485	3,500	6,070	10,080	4,150
Ft. Wayne, (St. Marys) above	665	1,550	1,550	1,317	7,360	2,488
Ft. Wayne, (St. Joseph) above	Not tak'n	1,260	1,400	813	5,860	2,333
Ft. Wayne, (Maumee) below	145,400	39,040	37,510	7,040	20,080	49,814
Defiance, (Maumee) above	329	838	1,310	1,143	18,300	4,384
Defiance, (Maumee) below	723	6,900	5,720	7,540	22,040	8,585
Napoleon, above	569	210a	575	5,450	7,710	2,903
Napoleon, below	992	4,315	1,100	26,520	16,400	9,865
Toledo, above	270a	250a	195	1,342	7,360	1.883
Toledo, Cherry street	1,030	5,310	4,275	4,250	19,160	6,805
Toledo, Riverside Park	576	220a	4,370	13,600	16,100	6,973

Bacterial Characters. After contemplating some of the complications, shown in the preceding graphical representations of the chemical results, arising from unusual local disturbances, it at least affords a feeling of relief to look upon the simpler bacterial curves for this same river. (Plates 30 and 31.) As is well known the addition of sewage greatly increases the number of bacteria, and thus we look for an upward turn of the curve under the influence of pollution from sewage. Without exception this occurs each month at each city throughout the stream. The amount of the increase is not however constant, but varies with local conditions and rainfall influences. These curves are plotted to the logarithms of the numbers rather than to the numbers themselves, and it should be borne in mind that a small increase on the plate means a much larger increase with the actual number of bacteria. The sewage effects are most noticeable at Findlay, Lima and Ft. Wayne, agreeing with the chemical findings as shown by the free ammonia determinations. At Defiance the increase is somewhat lessened by the dilution from Tiffin river, whose waters first appear in our samples below Defiance. The bacterial findings of the Maumee and Auglaize rivers as they reach Defiance are nearly the same. The increase at Toledo is not as great as might be surmised would follow from the large number of people having access to the sewers of that city. But the results agree well with the chemical findings. At this city the Maumee is a stream of no small dimensions (at times its volume exceeds 285,000 cubic feet per second—computed from gagings) and this amount of water could receive a large quantity of pollution and show only small increases in the determinations sought. The river at Toledo is greatly affected by the direction and velocity of the wind. With the wind blowing hard from the lake the river water is forced back by water blown in from the lake. We desired to study the effect of such action upon the pollution of the city water supply of Toledo, as the intake is but a short distance up the river. The elements were against us and the wind was blowing from some other direction when we were in Toledo. The nearest approach to a wind favorable to a solution of this problem was in July, and in fact the chemical and bacterial results for that month place the three Toledo stations more nearly on the same level of pollution. We were enabled to approach this question negatively, i. e., by noting the *increase of change* produced in our determinations when the wind blew down the river. Under normal weather conditions and a fair current we would expect little or no pollution at the Toledo intake, considerable pollution at Cherry street, and slightly more at Riverside. We find this state of affairs in the September and October samples bacteriologically, and also chemically, i. e., as far as free ammonia, nitrites and chlorine are concerned. Chemically the same is true in August, but the Riverside bacteriological result is low, due to the count being interfered with. The river runs in a northeasterly course, and accordingly a southwest wind would blow down the river, while a similar effect would result in a lessened degree from a south or a west wind. Through the kindness of the Weather Bureau Observer at Toledo, Mr. W. S. Currier, we append the following table of wind movements on the days of sampling, and for three days preceding. The full effect of the wind upon the water on the day of sampling would not have been attained at the hour the samples were taken :

Date.	Prevailing direction.	Total wind movement.	Maximum velocity and direction.
1898.			
July 20	N. W	244	19 miles W.
" 21	E	257	14 " N. E.
" 22	N. E	192	17 " N. E.
" 23	N. E. and E	187	16 " E.
August 22	S. W	114	12 " S.
" 23	S. W	296	26 " S. W.
" 24	N. W.	150	15 " W.
" 25	W	270	21 " N. W.
September 25	N. W	136	12 " W.
" 26	N. W	273	25 " N. W.
" 27	W	143	12 " N. W.
" 28	E	141	12 " S E.
October 23	S. W	333	20 " S. W.
" 24	S. W	343	29 " S. W.
" 25	S	322	26 " S.
" 26	N. W	356	26 " N. W.
November 11	N. W	208	20 " N. W.
" 12	W	125	9 " S. E.
" 13	W	173	17 " S. W.
" 14	W	230	17 " W.

In October a strong wind had blown for three days with the current. The field note book of the collector records at that time "all of the water has been blown out of the river except in the channel." This caused a good current which carried Toledo pollution away from the Toledo intake, as shown by the analyses. In August and September the effect was somewhat similar, but less marked. A further study of this problem is desirable, but the foregoing facts would indicate that under adverse circumstances Toledo at times receives at the intake a greater or less amount of her own sewage.

The bacterial findings on the Maumee watershed show results from rainfall and consequent soil washings similar to those obtained in the work on other rivers. At such times the number of bacteria was increased as shown above Lima in September and at several places during the wetter months of October and November. The lowest findings were at times of low water, viz.: July and August. On the other hand, sewage pollution of the river is so great at certain points resulting in great numbers of bacteria, that the high number of microscopic plants in the soil-washings from a sudden rain is not sufficient to equal the number in the sewage polluted river water and thus at these points a dilution occurs. In other words, wet weather conditions, as below Findlay in September, and below the other larger cities in October and November, yield a lower number of bacteria than dry weather conditions at the same places. Had the acid at Findlay in August been constant, its effect would have been noticed more. The amount of acid present was not such as to kill the bacteria, but it would have hindered many species from an active multiplication, and thus lower counts would have resulted. As it was the samples were taken too soon after the influx of the acid to show any marked features. A count below Findlay in August, after a hard rain, is consistent with the other results at the same place compared with the weather and the pollution. For some reason, not apparent the number of bacteria is unusually low below Ft. Wayne in October. The St. Mary and St. Joseph for that month also show counts below the average. The lowest results on the watershed were obtained at Findlay, Napoleon and Toledo—those at the last two places being due in part at least to the failure to get an efficient count because of an interference from overspreading growths on the plates. Accordingly these counts are too low, and this should be borne in mind. In addition to these low results of doubtful value there were but three findings in the river water of this watershed, yielding less than 400 bacteria to the c. c., viz.: July above Findlay, July above Defiance on the Maumee, September above Toledo. On the other hand, over 74 per cent. of the tests showed upwards of 1,000 bacteria to the c. c. No data are available to indicate the bacterial purity of the headwaters, as some pollution occurs above each one of our upper stations, and thus we cannot tell whether the water at any time regains its original purity. If it does, then the original bacterial purity could not have been very good, as seen by a study of the table already given. The following table shows better the average condition. Only the above town stations are given. They are supposed to represent the places where the river water is in its most purified state. The first column gives the average of the five months, in the second column (excepting Findlay) is shown the average omitting the month, showing an unusually high number of bacteria due to rain influences. No omission was made at Findlay, as conditions were such that no month gave an exceptionally large number of bacteria:

	Average for five months.	Average for four months.
Findlay above	1,011	1,011
Lima "	1,776	1,358
Defiance, Auglaize, above	4,150	2,668
Ft. Wayne, St. Mary, "	2,488	1,270
Ft. Wayne, St. Joseph, "	2,333	1,158
Defiance, above	4,384	905
Napoleon, "	2 903	1,701
Toledo, "	1,883*	514*

* Low counts due to interference from overspreading growths.

The samples taken from the Maumee river were more closely related to rainfall conditions than those from the Sandusky river, and moreover the Maumee is a deeper stream and less obstructed by dams, consequently its water is not so well aerated and exposed to sunlight as the water of the Sandusky. Under these conditions we find the number of bacteria higher in the stream under discussion than in the preceding one. The number of bacteria as shown by the results obtained is not low enough to make the Maumee water a desirable one for potable purposes.

REPORT ON

SOURCES OF POLLUTION AND PUBLIC WATER SUPPLIES OF THE SANDUSKY AND MAUMEE WATERSHEDS.

By B. H. Flynn, C. E.,

Engineer Ohio State Board of Health.

THE SANDUSKY WATERSHED, INCLUDING SANDUSKY CITY.

GENERAL FEATURES OF THE WATERSHED.

The Sandusky river rises in the western part of Richland county, flows west through Crawford and into Wyandot, then north through Seneca and Sandusky counties and empties into the western end of the Sandusky Bay. The river is 115.5 miles long and has a watershed some 1,581 square miles in area. Its valley is small, having a depth of from 20 to 25 feet and an average width of one-fourth of a mile or less. The bed is usually cut into the limestone or shale for a few feet. The head waters of the river east of Crestline have an elevation of 1,282 feet above sea level or 709 feet above the lake. This gives the river an average fall of 6.14 feet per mile. The Sandusky river consists of several branches until Crestline is reached, but the figure given for the elevation of the head waters is for one branch only. Starting from Crestline with an elevation of 1,155 feet, the average fall of the river per mile is 5.2 feet.

The following table gives the elevations at the different stations, the distance, and the average fall per mile between stations:

Stations.	Elevation above sea level.	Distance between stations in miles.	Average fall per mile between stations.
Head waters	1,282	......	......
Crestline	1,155	4½	28.2
Bucyrus	995	16	10.0
Upper Sandusky	835	24	6.7
Tiffin	743	34	5.7
Fremont	613	21	4.3
Lake Erie	573	16	2.5

As seen from this table the river has a good fall, hence a good flow, except below Fremont. Here the Sandusky winds in and out through low, flat, and in many places, marshy land to the Bay ; where it spreads out over a broad plain covered with grass and lilies. The water is raised and lowered a foot or more over these plains by the wind, but it is never more than a few feet deep.

Originally the headwaters of the Sandusky were supplied by several springs, 4½ miles east of Crestline, but since these have been appropriated for a public water supply for Crestline, it gets no water from them, especially in summer, and must depend upon the West Branch and upon Stink creek, both of which are supplied to a small extent by spring water and to a much larger extent by the sewage of Crestline.

The river has a number of tributaries, none of which are very large. The principal ones are Broken Sword, Tymochtee, Sycamore, Honey, Wolf, Muskalung and Green creeks, the latter entering the river almost at its mouth.

On the Sandusky river watershed there is an estimated population for 1898 of 100,000; 39,500 of which is in the seven towns of Bucyrus, Carey, Crestline, Fremont, Sycamore, Tiffin and Upper Sandusky ; while the remaining 60,500 is scattered through some fifty small villages and isolated houses. The average population per square mile is 63.2, of which 25.3 is urban and 37.9 is rural. These figures are much below the average for the State, and show the watershed to be thinly populated.

The towns mentioned above, except Carey and Sycamore, have more or less complete systems of sewers, all of which empty directly into the Sandusky river. These sewers, however, only carry the sewage of about 13,000 people. These same cities also have public water supplies, all of them using for that purpose at least some of the raw river water. The average daily amount of water pumped from the river is 2,700,000 gallons, which, after being soiled with the cities' waste, is returned to the river as sewage to be pumped out by the next city below and sent through the same course again. In the summer the three upper towns, Crestline, Bucyrus, and Upper Sandusky, use all the river water for the public supply, so that the river below each of these places is practically pure sewage.

Carey has a water supply from wells and is off the Sandusky river also, so it is not influenced by the pollution of the river. Sycamore is also removed from the river and is now putting in a water works which will be supplied by well water.

In examining the river, special attention has been paid to its pollution for ten miles above each water works, in view of the following ordidinance :

Section 2433. The jurisdiction of any corporation owning water works, to prevent or punish any pollution of the water, shall extend ten miles beyond the corporation limits. (O. L., 66 v., 209.)

The river has also been examined in and below each town with special reference to any nuisance from the sewage, and also any local contamination of the water supply from the town's own sewage.

DAMS.

Owing to the important bearing of these obstructions upon the ability of a river to supply water and to dispose of sewage, a short description of the dams on the Sandusky river will be given. There are sixteen dams on the river, four of which are used to impound water for a public supply and the rest used mainly to furnish power to grist mills. The following table gives the name, location, use, size, length of back water and pond area of the various dams:

TABLE SHOWING DAMS ON SANDUSKY RIVER.

Number.	Name.	Distance from mouth of river.	Approximate location.	Use.	Width in feet.	Height in feet.	Lenth of back water in miles.	Pond area in acres.
1	McMickles	96	1½ miles above Bucyrus	Watering stock	60	2.5	3	20
2	Water works	95	Just above Bucyrus	Water supply	50	1.5	1	8
3	Water works	94½	In Bucyrus	“ “	70	2.5	0 5	4
4	Gas works	94	“ “	Gas works	70	4	0.25	3
5	Water works	70	In Upper Sandusky	Water supply	70	2.5	0.1	0.6
6	Indian Mill	68	Below Upper Sandusky	Grist mill	60	7	1	6
7	St. Johns	45	9 miles above Tiffin	“ “	175	3	1	20
8	Water works	38	Just above Tiffin	Water supply	175	5.5	4	80
9	Pioneer Mills	37	In Tiffin	Grist mill	250	7	1	45
10	Spec	36½	“ “	“ “	225	8	0.3	14
11	Beckley	36	Just below Tiffin	“ “	250	4	0.5	15
12	Bakers	34½	2 miles below Tiffin	“ “	250	4	“ Broken out.”	....
13	Umsted	32½	3½ miles below Tiffin	“ “	200	6	1	25
14	Fort Seneca	28	8 miles below Tiffin	Tile mill	200	5	1	25
15	Ballville	18	2½ miles above Fremont	Grist mill	300	14	1.1	30
16	First Dam	17	1½ miles above Fremont	Electric power	300	14	0.5	15

All the mill dams except the ones at Ballville are of wood construction and in a bad state of preservation. They leak badly all the time, being repaired just enough to keep the mills running. The water works dams are kept in better shape, as all the water has to be utilized in dry weather. The two dams above Fremont are in a good state of preservation and leak but little. At the time of the inspection of this river, July 20, 1898, the water was running 12 inches over the St. John's dam, giving an approximate flow of 525 cubic feet per second, or 341,000,000 gallons per 24 hours.

POLLUTION OF WATERSHED.

Practically all the pollution of the Sandusky watershed is due to the five towns located on the Sandusky river itself. Carey has a water supply and will soon send sewage to Tymochtee creek, but it has but little as yet. Sycamore is just putting in a water works and will soon find sewers necessary. Attica has no sewers as yet, but will soon need them, as it has a public water supply.

Crestline—Population 2,968. This village has the good fortune to be at the upper end of the watershed above all pollution of the river, except that which it sends in itself. Crestline is a railroad town with some manufacturing interests. It has paved streets, electric lights, a water supply and a fair amount of sewers. The water supply is from springs and wells over in Richland county.

Sewage—Crestline is fairly well sewered, two sewers emptying into the West Branch of the Sandusky river and six emptying into "Stink creek," and comprising in all about four miles of sewers. About 70 per cent. of the population have access to the sewers and there are 60 water closets connected to them, but no vaults. The water closets are not used much in summer, every one depending upon outdoor vaults. The vaults are not water-tight and are not regulated by the village in any way.

" Stink creek " as it goes through town is nothing but an open sewer. At the time of inspection, July 19, it was dry above town and supplied entirely by sewage, and this principally from the main hotel. It is a very foul smelling, dirty ditch, covered with black scum and all the pools full of filthy sewage mud. In hot, sultry weather the ditch can be smelled all over town and causes a terrible nuisance. Filth of all kinds is thrown into the stream, and many open privies are built directly over it or so close that every rain will wash their contents into the ditch. It also drains two cemeteries which lie just east of town over in Richland county. Below the sewers the creek is a succession of small pools and is overgrown with weeds and bushes. This causes the appearance of the stream to rapidly improve, so that about a mile from the last sewer the stream has no smell and is comparatively clear.

The West Branch is in good condition above town, and it is claimed, never goes dry; but as it was only a few inches deep at the time of inspection, it can dispose of but little sewage. This creek only receives two sewers and as these have but few connections, the stream is in much better shape than the other one. Below each sewer there is some deposit and the water is black, greasy and covered with scum, but four hundred yards below the last sewer the sewage is not visible.

These two creeks unite about a mile from town and form the Sandusky river. The river at this point winds slowly through a flat clay bottom land, and has no smell and but little sediment and this is not offensive.

Wells—Nearly every house has a private well and these are used to a large extent for domestic purposes. The dug wells are from 20 to 30 feet deep and only go into the drift. There are three private drilled wells which furnish good water. These are 100 feet deep and go through the drift and shale into the sandstone.

Bucyrus—Population 8,516. This town has paved streets, electric lights, a public water supply and a sewer system. It has nothing but general manufacturing, being supported mainly by the country around it. The water supply is from the Sandusky river.

Sewage—The city is well sewered, fully ninety per cent. of the population having access to the some eight miles of sewers. There are about three hundred water closets and three hundred vaults connected to the sewers. As shown on the map, the sewers empty at the most convenient point into the Sandusky river. The first sewer below the water works has but few connections and the river above the small mud dam at the brewery is in fair shape. But starting with the sewer from the brewery, the river as far down as the cemetery is an open sewer, each tributary sewer adding more filth before the river has had time to recover from the last one. The small dam opposite the brewery is to back the water up so that it can be pumped to the adjacent ice pond. At this time, owing to the recent rains, this dam was allowing some water to escape, which helped to dilute the brewery sewage, but did not prevent the river from being covered with a thick, black scum and giving of a horrible stench. From this point down the river is a succession of stagnant pools with their bottoms covered with a foot or more of thick, black mud that constantly gives off bubbles of gas. The water is black, greasy and covered with a thick black slime. It is claimed that the river is in good condition now and that it becomes much worse when there is no rain.

The gas works dam is used to impound water for washing the gas and condensing purposes. The refuse of the gas plant is discharged above this dam. It consists of naphtha, grease and lamp black. The quantity is not large, but it discolors the river badly. Just below this dam the main sewer enters, and as the dam held all the water notwithstanding the recent rains, the river from this point was pure sewage. Night-soil is buried in shallow trenches near the river, below town, and every hard rain washes some of it into that stream. Kitchen garbage, hog pens, geese, slaughter houses, all combine to make the river at this point one of the worst in the State.

Vaults are required to be water-tight and 50 feet from wells. All the old ones violate the first part of this regulation, however.

Wells—Well water and filtered cistern water are used entirely for drinking purposes, as the public water supply is not recognized as fit for domestic use. Most of the private wells are dug, and from 20 to 30 feet deep, going through the soil and gravel down to hard-pan. In the southeastern portion of the city, the wells go through a shale into gravel and the water comes to the surface. It is claimed that there is enough water in this section to supply the whole town. There are about a dozen drove wells in use. These extend into the hard-pan for a few feet.

Upper Sandusky—Population 3,597. This village has electric lights, a water supply, some sewers, but no paved streets. The public water supply is from the Sandusky river. It is a quiet country village with not much manufacturing. The surface drainage and sewerage is to the Sandusky river and to small ditches emptying into that river.

Sewage—The town has but an average sewer system, some seventy-five per cent. of the population having access to it. There are 5.2 miles of sewers with five outlets direct to the river and two to ditches. There are 104 closets and eight vaults connected to the sewers. Fifty of these closets are in the schools and jail. The large west side sewer empties into Juvenals run, which would be dry a greater part of the time were it not for the sewage. It is badly overgrown with weeds so that it holds the sewage until it decays, causing considerable nuisance. The river below town was not in bad shape at the time of inspection, July 13, but it is said to go nearly dry and then smell from the sewage.

Wells—There are about two hundred dug wells in town, which are used for domestic purposes. These are from 10 to 20 feet in depth and only go through the sand and gravel to the hard-pan, thus getting all surface water. There are about twenty drove wells. These go through the hard-pan to the limestone which lies about 65 feet below the surface.

Carey—Population 2,000. Carey has a public water supply and electric lights but no sewers or paved streets. The water supply is from wells west of town. There are but few manufacturing plants in the village.

Sewage—The surface drainage is to Spring run, then to Tymochtee creek which joins the Sandusky river 57 miles from its mouth. Carey is eight miles by water from the Sandusky river. About twelve houses have cesspools draining to Spring run through private sewers. All others use outdoor vaults. Even this small amount of sewage causes the run to become a nuisance in summer. It gets full of weeds and has to be cleaned out and flushed each year.

Vaults are constructed in any suitable manner, but must be 100 feet from wells. Slaughtering is done near Spring run, but the refuse is hauled away. Quite a number of hogs are kept within the corporation limits.

Wells—The private wells are mostly drilled, but only from 6 to 20 feet deep, getting their water just above or in the limestone.

Sycamore—Population 1,500. This village has electric lights, but no sewers or paved streets. At the time of inspection a water supply was just being introduced. The water is to be pumped by an air lift from two wells, each six inches in diameter and 200 feet deep to a receiving well. The water will then be pumped to an elevated tank by a Snider-Hughes pump of 500,000 gallons capacity. There are four miles of mains in, with fire plugs attached, but no domestic services have been put in as yet.

The surface drainage is to Sycamore creek, which joins the Sandusky fifty-one miles from the mouth of the latter. Sewers will soon be necessary Now every one depends upon shallow vaults and, in many cases, mere pits.

Tiffin—Population 13,900. This city has nearly all the modern improvements required, electric cars and lights, paved streets, sewers and a water supply. The water is taken from the Sandusky river and from wells. The principal industries are two glass works, a pottery, three or four large machine and agricultural works, a door and sash factory, a small woolen mill and two breweries.

Sewage—The accompanying map shows the locations of the sewers and their outlets. There are eight miles of sewers with 10 outlets to the Sandusky river and one to Rock creek. Some 80 per cent. of the population have access to the sewers, and there are some 450 vaults and water closets connected. An ordinance requires vaults to be made water-tight, but does not limit their distance from wells. All the old vaults are not water-tight, usually being boarded up only. There are quite a number of dry earth closets in use.

The Pioneer Mill dam at the foot of Webster street backs the water up to the water works, so that the whole river in front of the city is back water. Into this back water is dumped all the sewage of the city. When the river is low this back water is very foul, it is covered with scum and gives off pretty strong odors, while the river bottom is overlaid with a thick layer of black sewage mud. When the dam is full the large quantity of water seems to hide the sewage for a time, but if the mill did not use the water, and it was compelled to stand for any length of time, the sewage would soon make the river unbearable. As it is, the water collects for a time and gets saturated with sewage, it is then turned down the river and the empty bed is left the putrefy and smell in the sun until more water comes down and fills it up again. A large pulp mill formerly turned its waste into the river, but this has been shut down for some time past. As shown on the map, there are 12 slaughter houses and two breweries that turn their refuse into the river. A distillery and woolen mill also add their waste products to the river's fund of impurities.

Wells—When the river is muddy, well water is used almost entirely for domestic purposes. This water is principally from shallow dug wells, which only go to the limestone, some 16 feet down. All the new wells are drilled into the rock and get a fair water. Filtered cistern water is drunk to some extent.

Fremont—Population 6,236. This city, the county seat of Seneca county, is a very pretty residence place and has considerable manufacturing also. It is the head of the navigation on the Sandusky river, though but few boats come up now.

Sewage—The surface drainage and sewerage is direct to the Sandusky river. There are about 16.5 miles of sewers, with four outlets to the river and giving about 75 per cent. of the population access to them. The sewers empty directly into the Sandusky at the most convenient point, except those of the west side, which empty into an intercepting sewer, running along the west bank of the river and provided with storm overflows to the latter. No record is kept of the sewer connections and no one would even venture an estimate as to the number, but it cannot be large, from the common use of outdoor vaults. An ordinance requires that all vaults shall be 50 feet from a well, unless they be water-tight, and this is required now. All the old vaults are not tight, usually only having plank sides, and some times not even that.

When the river is low the sewage causes considerable nuisance. The river becomes covered with a green scum, smells some and the bottom has considerable sediment. This is especially true around the mouth of the intercepting sewer. When the wind is up the river, it raises the level of the water a foot or more, but it probably never blows the sewage up past the water works on account of the old dam some distance below the intake

Wells—The city water, when clear, is used for domestic purposes by fully two-thirds of the people, but when muddy nearly every one resorts to private well water. This water is obtained principally from dug wells, there being only some 20 drilled wells in use. The dug wells go to the bed rock, which is 16 feet below the surface near the river, and 45 below further back on the hills. The drilled wells are from 50 to 75 feet deep and go through the clay, hard-pan and gravel into the rock.

Sandusky has been included in this group, but as its sewage bears no relation to the pollution of the watershed but does bear on its own water supply, it will be taken up in connection with that subject.

PUBLIC WATER SUPPLIES.

There are seven towns on this watershed that have public water supplies. Two only, Bucyrus and Upper Sandusky, use nothing but river water, though Fremont and Tiffin depend mainly upon the river. Fremont has galleries and wells to help out, while Tiffin has wells. Crestline uses spring and well water. Carey uses well water, and Sycamore will in time be using well water. Sandusky which is grouped with this watershed uses the Bay water. Attica uses a well and gallery supply.

Surface Water Supplies.

Bucyrus—Population 8,516. The water works was put in by a private company in 1883 and has cost to date something over $75,000. The company operating the water works does so under a franchise granted in 1895. It previously worked under one granted in 1883. The following paragraph, from the last ordinance, specifies the kind of water to be supplied:

"Said, 'The Bucyrus Water Company,' further agrees that it will construct within the period of eight (8) months, a reservoir, having a capacity of not less than 60,000,000 gallons and located at a point suitable and near to and in connection with the pipe distribution of said Company.

"It is mutually agreed that the water with which said reservoir shall be filled, from which the water supply is to be carried into the system of distributing pipes of said company; is to be taken from the running waters of the Sandusky river, and shall be settled and filtered before being forced into the pipes for distribution for domestic use; and when so filtered, it shall be considered suitable for the requirements of this contract."

The present source of supply is the Sandusky river. The only possible source of pollution to the river within 10 miles is Knisely springs. This is a picnic ground about eight miles from Bucyrus and one-half mile back from the river. It has no sewage, but the surface drainage is direct to the river. Of course the most serious danger to the Bucyrus water is the village of Crestline 16 miles from the intake by river. The river water above the water works is not in good condition. It is covered with scum in many places and has a greasy, murky appearance.

Owing to the small amount of water flowing in the river in summer, it is necessary to store a little water to tide over dry spells. The water company has a small dam one-half mile above the intake, which will hold back when full about 2,000,000 gallons. At the water works there is another dam which backs the water up over the intake pipe. This dam also retains something over 2,000,000 gallons. No attempt is made to protect these reservoirs, boys swim in them, barn yards drain to them, and hogs and cattle have access to them.

The company has purchased land for the reservoirs required in the franchise, but has not even started to build them as yet. When the works were first put in, the water was taken from a well near the river, but this soon failed and direct connection had to be made to the river, which is now the sole source. The river at the intake has a drainage area of 94 square miles.

The old supply well, now serving as a pump well, is 50 feet in diameter and 30 feet deep, and is connected to the river by a 16-inch pipe; the water stands 13 feet deep in the well or at the level of the river above the dam. It is covered with a conical board roof and no trouble is experienced from growths. It was cleaned in 1892, but only a small quantity of mud was removed as the suction of the smaller pump is right on the bottom of the well and keeps it fairly clean.

Direct pressure is furnished by two pumps, both put in in 1883 and in fair condition now. One is a compound duplex Holly pump of 1,500,000 gallons capacity and the other is a compound duplex Walker pump of 1,000,000 gallons capacity.

Before reaching the mains, the water passes through two Hyatt pressure filters erected in 1886. They are the old style vertical filter, 10 feet in diameter and contain 2½ feet of crushed granite and 1½ feet of coke. The filters are washed from once in two days to twice a day, as the condition of the water requires. This is done by reversing the flow of water through the filter, and is not assisted by any mechanical stirrer. Sulphate of alumina is used when "necessary," which means hardly ever. Only 11,700 pounds or about 30 barrels were used last year. The strength of the coagulant solution is varied according to the muddiness of the water. In case of fire, the filters are cut out. A couple of years ago the filters were cleaned out and a lot of rubbish, dead animals, etc., removed.

There are 12 miles of mains in, which give some 70 per cent. of the population access to the water. There are 500 services in, of which 325 are in use and 175 of these metered. The average daily consumption is 691,000 gallons, which, reduced 10 per cent. for slip of pumps, would be 622,000 gallons. Owing to leakage at the filters and to wash water, the average daily consumption is not over 550,000 gallons. The average daily consumption per consumer is 280 gallons, but this does not mean much here, as the water is not used for domestic purpóses at all.

The yearly water rates are as follows:

Private house, five rooms or less	$1 25
Each additional room	25
Private bath tubs, each	1 00
Private water closets, each	1 00
Private stables, per stall	75

Meter rates per 1,000 gallons:

Below 1,000 gallons per day	25
5,000 to 10,000 gallons per day	10
Above 10,000	08

Upper Sandusky—Population, 3,597. The water works is owned by a private company operating under a franchise granted in 1889, when the works were first built. The plant has cost to date about $70,000. The city may purchase ten years from April 23, 1889, and every five years thereafter. The franchise contains the following clause regarding the kind of water to be supplied:

"The source from which the supply of water shall be obtained is from wells sunk in the gravel banks of the Sandusky river or river water dispossessed of earthy matter by settling pools.

"The wells are to be so constructed and protected that no surface or unfiltered river water shall enter them, the intention being to obtain a pure and wholesome supply from a subterranean strata of gravel.

"These wells shall be increased from time to time as the wants of said village demand, and the source shall always be protected from pollution and contamination.

"A separate suction pipe may be run to the river to be used in cases of great emergency only."

The supply is taken at present direct from the Sandusky river at a point just above the city. The river at this point has a drainage area of about 285 square miles. Above the intake the river flows through rolling land, much of it being in pasture, which gives hogs and cattle free access to the water. For the first few miles the river flows over a mud and gravel bottom, but above this the limestone outcrops and forms most of the bed. There are no villages to pollute the water within the 10-mile limit, the greatest danger being from the sewage of Bucyrus, 24 miles distant. About a mile and a half above the water works is a collection of large springs. It is claimed that in summer these springs supply the river entirely, and that no water flows above them, but inspection showed a small amount of water coming down the river. Two miles above the intake a small run brings in the drainage of the principal cemetery of the town. It is three-fourths of a mile from the river.

At the water works the river is backed up by a small dam forming an impounding reservoir of about 500,000 gallons capacity. From this pond the intake pipe leads to a filter box, but usually the water passes direct to the pump well without filtering. It is claimed that the direct connection to the river is used only when the latter is clear, and that when the river is high and muddy, the water is pumped to a large reservoir, allowed to stand a certain length of time, then passed to the filter box and filtered, then allowed to flow to the pump well. This storage reservoir is 325 feet long by 180 wide, and will hold 2,288,000 gallons. It has earthen embankments and floor, with no riprap or paving. It is protected from surface drainage by a ditch running along the crest of the hill above it. The reservoir was only built in 1895 and has not been cleaned since and no trouble is experienced from growths.

The filter box is 11 by 20 feet and contains three feet of fine gravel. It is used to filter the water from the reservoir only, and acts as a strainer merely. It is cleaned about once a month by scraping off the top layer and twice a year by removing and washing all the gravel.

The pump well is 85 feet in diameter at the top and 12 feet deep, with sides paved with rough stone. Originally this well supplied the town with ground water, but it soon failed and direct communication had to be made to the river. Some ground water is probably still supplied by it.

Two Blake pumps of 1,500,000 gallons capacity each are used to pump the water to the standpipe. These pumps were put in during 1889, and are in but fair condition at present. One pump working 14 to 16 hours per day is enough to supply the town. This would give an average daily consumption of 325 000 gallons for the summer or an average of 250,000 gallons the year round. No records whatever are kept of the pumps and the above figures are estimated only.

The standpipe was built in 1889 and is in bad shape now. It consists of a wooden tank 24 feet high and 28 feet in diameter, holding 95,000 gallons, and placed on a circular brick tower 75 feet high. The water mains cover practically the whole town, only 30 houses not having access to them. There are 456 services in, but only 350 of these in use, 11 of which are metered. Although one-half of the people have the public water in their houses or yards, it is estimated that fully 75 per cent. of the total population drink well or spring water. The average daily consumption per consumer is 110 gallons.

The annual water rates are as follows:

Private house, five rooms or less	$5 00
Each additional room	1 00
Private water closets, each	2 00
Private bath tubs, each	1 00
Private stable, one horse and carriage	3 00

Meter rates per 1,000 gallons:

One thousand gallons or less per day	25
Over 5,000 gallons	10

River and Wells.

Tiffin—Population 13,900. The water works is owned by a private company operating under a franchise granted December 1, 1879, and extending for 25 years. It contains no provision for purchasing works by the city and has the following clause regarding the water:

"That there is hereby given and granted to the 'Tiffin Water Works,' their associates, successors or assigns, the exclusive right and privilege for the period of 25 years from and after the date of the passage of this ordinance, of supplying the city of Tiffin, Ohio, and the citizens thereof, with water to be taken from such points and in such manner as will best subserve the object and purposes of said 'Tiffin Water-Works,' their associates, successors or assigns, in complying with the objects and requirements herein enumerated."

Nothing whatever is said regarding the kind or purity of the water to be supplied.

The supply at present is taken from the Sandusky river and from wells. There is nothing to pollute the river for 10 miles above the intake, except, perhaps, a picnic grounds a little ways up the river. These grounds are not much used now, but two dirty vaults still stand on he river bank. Tiffin is 34 miles by river below Upper Sandusky, which is the nearest serious source of sewage pollution.

About 400 yards above the water works a dam impounds water for the city supply and also to furnish power to run the pumps for a part of the time, usually all night. The intake is just above the dam, the pipe leading to a small reservoir from which the water is pumped. There are seven drilled wells along the river bank which are pumped directly to the mains. These wells are from 200 to 268 feet deep, with a 10-inch casing; and they are located 200 to 300 feet apart, extending up and down the river valley. The suction from the pumps is connected directly to the casing and the water is lowered 24 feet during pumping hours. The water is hard but of good quality otherwise. The water is found in the Onondago limestone which outcrops in this locality.

The company claims that these wells supply all the city water except in cases of emergency, but these cases happen nearly every summer afternoon, when the river water is turned into the mains to help out. They also claim that they intend to improve the method of pumping the wells so that no river water need be used at all.

Direct pressure is furnished by three pumps, all made by the Holly Manufacturing Co. One pump of 1,500,000 gallons capacity was put in in 1879, and is run by water power. A steam pump of 3,000,000 gallons capacity was put in about 1882, and another of 4,000,000 gallons capacity was erected in 1895. The average daily consumption is 900.000 gallons. This is only the estimate of the engineer, as no better figure could be obtained. The average daily consumption per consumer is 165 gallons. There are 26 miles of mains, giving about 75 per cent. of the population access to the water. There are 1,275 services in, of which only 900 are in use and 100 of these metered.

The meter rates are 30 cents per 1,000 gallons and 15 cents for the largest consumer. The flat rates seem to vary with the amount of influence the consumer has with the council. There are no definite fixed rates.

River and Gallery.

Fremont—Population 6,236. The water works was put in by the city in 1883 and has cost to date $160 490.

The supply is from the Sandusky river, wells and galleries. The river at the water works has a drainage area of 1,280 square miles. The only sources of pollution to the river within 10 miles are the small villages of Fort Seneca and Ballville. The first place is a small station just 10 miles above the intake. Ballville has some 300 inhabitants and is situated on the river bank, so that all its surface drainage goes direct to the same. It has no sewerage.

The river water is admitted by three 10-inch pipes to a reservoir excavated in the solid rock below the river level. This reservoir is also supplied to some extent by three lines of from six to nine-inch vitrified tile, with a total length of 1.5 miles, which are laid in the gravel beds by the side of the river. The reservoir is 200 feet long by 150 feet wide and the water stands six to eight feet deep in it usually, or at the river level giving a capacity of from 1.4 to 1.8 million gallons‘ The reservoir is open, but its banks are carefully paved, and no trouble is experienced from growths or scum. It is cleaned of sand and mud by pumping out the water and raising the sediment in buckets, as the basin is too low for flushing. At the side of the reservoir is the pump well, 25 feet in diameter and 20 feet deep, and connected to the former by one 24-inch pipe.

There are five wells 10 inches in diameter and 300 feet deep. They were put in during the fall of 1897 and supply about 230,000 gallons per day. The wells are 300 feet apart and extend up and down the river bank. The machinery for pumping the wells is inadequate, and they can probably supply more water with better machinery, although the water is lowered 40, 50, 70, 75 and 125 feet in the five wells respectively.

The water is pumped to a standpipe by two Knowles' pumps, one a 3,000,000-gallon compound condensing duplex and the other a 1,000,000-gallon duplex. The standpipe located in the center of the city is 100 feet high and 25 feet in diameter, giving a capacity of 365,000 gallons. There are 10 miles of mains in with 856 services in, of which 720 are in use and 10 of these metered. About 75 per cent. of the total population have access to the water. The average daily consumption is 1,600,000 gallons and the average per consumer is 350 gallons. This is an enormous figure, and must be explained by the extravagant use of water in public fountains, watering troughs and for flushing sewers, and by the habit of allowing the water to run continually when it is muddy.

The yearly water rates are as follows:

Private house, six rooms or less	$5 00
Each additional room	50
Private water closets, each	2 00
Private bath tubs, each	3 00
Private stable, one horse and carriage	2 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	25
Over 4,000 gallons per day	10

Well Supply.

Carey—Population 2,000. The water work was put in by the village in 1894 and has cost to date $28,500. The supply is from five wells, 50 to 60 feet deep and 5⅝ inches in diameter. The wells obtain their water in the limestone, which lies 14 feet below the surface. When the wells are not being pumped the water is within 13 feet of the surface and ordinary pumping only lowers it about a foot.

The water is pumped direct from the wells to a standpipe by two horizontal, compound, duplex, Laidlow-Dunn-Gordon pumps of 500,000 gallons capacity each. The standpipe is 16 feet in diameter, 115 feet high and has a capacity of 173,000 gallons. There are four miles of mains, giving 80 per cent. of the population access to the water. There are 125 services in use, of which four are metered. The average daily consumption is 100,000 gallons, and the average per consumer is 130 gallons.

The annual water rates are as follows:

Private house, including street sprinkling	$6 00
Private bath tubs, each	2 50
Private water closets, each	3 00
Private stable, one horse and carriage	2 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	30
One thousand to 2,000 gallons per day	23
Four thousand or more gallons per day	15

Well and Spring.

Crestline—Population 2,968. The water works was put in by the village in 1871 and has cost to date about $205,000. The operating expenses for 1897–98 were $2,488. The supply is obtained from wells and springs 4½ miles east of the village. Two reservoirs have been built, one in 1871, holding 1,295,000 gallons, and one in 1888, and holding somewhat more than the first one. The second one is not in use at the present time. Not more than 3½ square miles of territory are tributary to these reservoirs, and some of this drainage is diverted by ditches around the reservoirs. Springs in the bottom and along the sides of the first reservoir supplied the town until 1895, when three wells were drilled. These wells are 140, 170 and 180 feet deep and the water flows from them freely. A 20-day test of the wells only lowered the water 22 feet, and shortly after the pumping stopped the wells began to flow again. The three wells supply 150,000 gallons per day by their natural flow, but have to be pumped about 48 hours a week to keep up the supply. This pumping is done by a three-quarter million Worthington compound pump, which was put in in 1896. The wells flow and are pumped to the first reservoir, which is 127 feet above the streets, and supplies the mains by gravity. The reservoir in use is formed by throwing earthern embankments across the ends of a ravine. Neither the bottom nor the sides are paved or ripraped. The bottom is covered with a foot or more of black mud and dead moss, and this covered with a thick layer of living moss.

When stirred, the mud gives off bubbles of gas which have a very disagreeable odor. The superintendent is trying to get the reservoir cleaned, paved and covered, which would remove the only objectionable feature of the Crestline water-works.

The water flows to the village through an 8-inch wooden pipe line, four and one-half miles long, but this furnishes an inadequate supply, especially in case of fire. The water seems to reach the mains clear and tasteless, but it must sooner or later be affected by the bad condition of the reservoir.

There are 10 miles of mains in, giving some 90 per cent. of the people access to the water. There are 370 services, of which 308 are in use, and 65 of these metered. The average daily consumption is 275,000 gallons and the average per consumer is 150 gallons.

The annual water rates are as follows:

Private house, 4 rooms or less	$3 50
Private house, 5 rooms	4 00
Each additional room	25
Private water closets, each	3 00
Private bath tubs, each	2 00
Private stable, one horse and carriage	2 00

Meter rates per 1,000 gallons:

From 1 to 10,000 gallons per year	40
From 10,000 to 500,000 gallons per year	12

Well and Gallery.

Attica—Population 729. Although this village has a public water supply, it is as yet bears no relation to the pollution of the watershed. As soon as the water supply is generally introduced, sewers will become necessary and some means of disposing of the sewage then found. The surface drainage is to Honey creek, to which the sewers would naturally lead. There are no sewers or drains in use now, the storm water being carried off in ditches. No water closets have been put in, everyone depending upon the outdoor vault.

Water Supply—The water works were put in by the village in 1895, and have cost to date about $17,147. The supply is from a large well and collecting gallery. The well is 28 feet in diameter and 25 feet deep. It is built of brick and covered with a conical board roof. The water is found in a bed of gravel which begins eight feet below the surface. In this gravel is laid 300 feet of 8-inch tile, which carries the ground water to the well by gravity. The well and gallery have so far supplied sufficient water. The site of the water works is at present removed from all local pollution.

The water is pumped to a standpipe by a Gordon pump of 500,000 gallons capacity, operated by a Hicks gasoline engine. The standpipe consists of a tank 20 feet in diameter and 25 feet height, with a capacity of 59,000 gallons, placed on a brick tower 40 feet high. The tank was cleaned in 1898 for the first time and a quantity of sediment removed. There are two and one-half miles of mains in, which give some 95 per cent. of the population access to the water. There are 63 services in, 61 of which are in use and 30 of these metered. The average daily consumption is 13 500 gallons, and the average for each consumer is 40 gallons.

The annual water rates are as follows:

Yard hydrant for one family	$3 00

No baths or water closets in use.

Meter rates per 1,000 gallons:

Less than 500 gallons per day	20
500 to 1,000 gallons per day	15
Over 3,000 gallons per day	06

Where the public water is on the premises it is generally used for domestic purposes.

The private water supply is from dug wells 20 to 25 feet in depth. These wells obtain their water from a bed of gravel and quicksand. As the ground is very porous and vaults are covered over when full, the ground water cannot help but be polluted.

Sandusky. Although Sandusky is not on the Sandusky river watershed, it can very properly be considered in this group. Sandusky has an estimated population of 20,888 for 1898, but the city claims 22,000 or more.

Sewage—The combined system of sewers is used, with some 31¼ miles in place, and 16 outlets to the Sandusky bay. There are 760 water closets and vaults connected to the sewers, representing the sewage of about 5,000 people. More than 75 per cent. of the population has access to the sewers. There are about 10 dry earth closets in use, all the rest of the houses using vaults, except those sewered, of course. All new vaults must be constructed of brick, stone or plank, and be as water-tight as possible, and none shall be less than 25 feet from any well or cistern. The sewage never seems to cause any nuisance, but as will be mentioned below, it may pollute the public water supply.

Water Supply—The water works was put in by the city in 1876 and has cost to date $572,603. The supply is from the Sandusky bay through an intake crib east of the city as shown on the map. Of course the bay water cannot be in first-class condition after receiving all the sewage brought down by the Sandusky river, but the source of this pollution is at least 35 miles distant and the dilution is so great that it can have but little if any influence.

The most serious source of danger to the water is the sewage of Sandusky itself. As shown on the map there seems to be two main currents in the bay, one going out past Johnson's Island and the other sweeping up past the city docks and out past Cedar Point. As the sewage of the city empties into the bay along the whole water front this second current carries all the city sewage. If the wind is blowing to the southeast, this current will be carried over to the intake crib and the city run very good chance of drinking sewage polluted water.

The intake crib is connected to the pump well by 1,800 feet of three-foot brick conduit, through which the water flows by gravity to a pump well. The intake is 1,200 feet from the shore line. The water is pumped from the receiving well to a standpipe, or direct in case of fire, by two Worthington pumps. One of 3,000,000 gallons capacity was put in in 1876 and the other of 7,500,000 gallons capacity in 1890.

The standpipe is 180 feet high and 25 feet in diameter, giving a capacity of 662,000 gallons. There are 40.4 miles of mains giving practically every one access to the water. There are 2,873 services in, of which 462 are metered.

The average daily consumption is 3,633,800 gallons which reduced 5 per cent. for slip and leakage would make the daily average 3,450,000 gallons. The average per consumer is 200 gallons and for the whole city the per capita consumption is 165 gallons, showing the almost universal use of the city water.

The yearly water rates are as follows:

Private house, five rooms or less	$5 00
Each additional room	1 00
Private water closets, each	2 50
Private bath tubs, each	3 00
Private stable, one horse and carriage	3 00

The meter rates are six cents per 1,000 gallons with certain minimum charges for the different sized meters.

No private wells are allowed in the thickly settled portion of the city and the only well water used comes from some 40 dug wells in the outskirts. These wells only go to the limestone, which is not more than five to 10 feet below the surface. Spring and filtered cistern water are drunk to a limited extent.

Thus it is seen that it is very important that Sandusky should have a pure water supply, as it is the only city in the whole group whose inhabitants must depend almost entirely upon the public water supply. Besides the danger from sewage pollution, the bay water is objectionable on account of its muddiness after every storm. As the average depth of the Sandusky bay is only seven or eight feet, every high wind stirs up the bottom completely and makes the water very muddy.

The following table gives a summary of both the water supply and sewage of the seven principal towns of the group:

SANDUSKY WATERSHED.

	Water supply.													
	Estimated population for 1898.	Source of water supply.	Method of supplying water.	Ownership of water works.	Date of installation of water works.	Cost of plant to date.	Miles of mains.	Per cent. of population having access to mains.	Number of services in use.	Number of meters.	Average daily consumption in gallons.	Average daily consumption in gallons per consumer.	Total pumping capacity.	Filters.
Bucyrus	8,516	Sandusky river	Pumping direct	Private	1883	$75,000	12	70	325	175	550,000	280	2,500,000	Hyatt pressure.
Carey	2,000	Wells	Pumping to standpipe	Village	1894	28,500	4	80	125	4	100,000	130	1,000,000	None.
Crestline	2,962	Springs and wells	Gravity from reservoir	Village	1871	205,000	10	90	303	65	275,000	150	750,000	None.
Fremont	6,236	Sandusky river, galleries and wells	Pumping to standpipe	City	1883	160,000	10	75	720	10	1,600,000	350	4,000,000	None.
Sandusky	20,888	Sandusky bay	Pumping to standpipe	City	1876	572,603	40.4	98	2,873	462	3,450,000	200	10,500,000	None.
Tiffin	13,900	Sandusky R. and wells	Pumping direct	Private	1879	?	26	75	900	100	900,000	165	8,500,000	None.
Upper Sandusky	3,597	Sandusky river	Pumping to tank	Private	1889	70 000	11	95	350	11	250,000	110	3,000,000	Small sand box.
Totals	60,099		Total	3 private		$1,111,103	113.4		5,601	827	7,125,000		30,250,000	
Averages	8 585			4 public	1882	185,184	16.2	83	800	118	1,018 000	184	4,321,400	

SANDUSKY WATERSHED—Concluded.

	Sewage.							
	Outlet of sewers and drains.	Number of outlets.	Is sewage a nuisance?	Does sewage cause pollution of local water supply?	Miles of sewers.	Per cent. of population having access to sewers.	Number of closet and vault connections.	Population using sewers.
Bucyrus	Sandusky river	6	Yes	No	8.1	90	600	4,000
Carey	Spring run	.....	"	"	.....	.....	*12	75
Crestline	Stink creek and west branch Sandusky	6—2	"	"	4	70	60	400
Fremont	Sandusky river	4	"	"	16.5	75	.....	.....
Sandusky	Sandusky bay	16	No	Yes	31.2	75	760	4,800
Tiffin	Sandusky river	11	Yes	No	8	80	450	2,800
Upper Sandusky	Sandusky river	7	"	"	5.2	75	112	700
Totals		52	Total 6 Yes	6 No	73	.....	1,994	12,775
Averages		9	1 No.	1 Yes	12	78	332	2,129

* Private sewers.

THE MAUMEE WATERSHED.

TERRITORY INCLUDED.

The Maumee watershed comprises the northwest corner of Ohio with adjacent portions of Indiana and Michigan. It has a total area of 6,344 square miles, of which Ohio has 4,702, Indiana 1,303 and Michigan 339. In Ohio the watershed contains all of Williams, Defiance, Paulding, Van Wert and Allen, and parts of Mercer, Auglaize, Shelby, Hardin, Hancock, Wyandot, Seneca, Putnam, Henry and Fulton counties. In Indiana it includes parts of Steuben, De Kalb, Noble, Allen, Wells and Adams counties; in Michigan only parts of Hillsdale and Lenowee counties. The southern part of the watershed is very flat, the broad plains being broken only by the gentle rises of the glacial moraines, and by the river valleys. The northern part of the watershed is not quite so level, the moraines are higher and the valleys deeper.

This whole region was at one time well covered with hard wood forests, but now all the heavy timber has been used up and the fields are gradually being cleared, though there are thousands of acres still left with their old stumps, brush and small timber just as the lumberman left them after taking out the best pieces.

On the cleared land corn is the chief crop especially in the southern part. Farther north the stock and dairy interests are large.

DRAINAGE.

The Maumee river flows northeast through the center of the watershed and empties into the western end of Lake Erie. Its principal tributaries are the St. Joseph and Tiffin rivers from the north, and the St. Mary and Auglaize rivers from the south. The St. Mary and St. Joseph rivers unite at Fort Wayne and form the Maumee river from there down, while the Tiffin and Auglaize rivers enter the Maumee at Defiance, giving the watershed a leaf or fan-shaped appearance. The Auglaize river has two quite large tributaries, the Ottawa and Blanchard rivers which enter it from the east.

The whole territory has been glaciated and the tributaries follow the depressions between the moraines while the Maumee has cut across them. In glacial time Lake Erie extended as far as Fort Wayne, covering a large portion of the Maumee valley and the outlet of the lake was through the Wabash river. Then the ice moved out of the St. Lawrence basin and gave the lake a lower outlet to the east. This caused all the territory tributary to the old lake to drain into the Maumee river which occupied the bed of the now vanished lake. The St. Mary and St. Joseph rivers formerly emptied into Lake Erie near its outlet to the Wabash. Then when the water was lowered they had the choice of flowing to the Wabash or doubling back into the old bed of the lake. Some peculiarity of slope made it easier to turn to the eastward than to continue their old course to the Wabash.

The territory drained by the Auglaize and St. Mary rivers is extremely flat and the drainage is poor, leaving the ground wet or even swampy in places. For successful cultivation all this land must be carefully ditched and tiled, which is now being done to a large extent. When this land was well wooded and no ditches cut, the streams must have had a very uniform flow throughout the year. Even at the present time with the forests cut away and the whole country ditched, the flow is remarkably uniform owing to the extreme levelness of the country.

North of the Maumee the country drained by the Tiffin and St. Joseph rivers is more hilly and the flow is kept up by the large number of springs. The ditches are supplied with "fountain water," in the language of the section.

The Maumee river has a length of 150 miles in which there is a fall of 164 feet, or an average of 1.1 feet per mile. This is a very small fall and makes the stream very sluggish. The Auglaize river has a length of 74 miles with a fall of 4.4 per mile, giving it one of the best currents in the watershed. It drains an area of 2,504 square miles.

The St. Mary river is 100 miles long, has an average fall of 2.38 feet per mile and drains an area of 784 square miles. In Indiana its fall is very much below the average, making its current there very slow.

The St. Joseph river has an average fall of 3.13 feet in its 100 miles of length and a watershed of 1,132 square miles. Just the reverse of the St. Mary, its greatest fall is in Indiana, where it is utilized by three mills.

The Tiffin river has a length of about 65 miles with an average fall of 4.5 feet per mile and drains 669 square miles of territory.

POPULATION ON WATERSHEDS.

In estimating the population on the watersheds the census of 1890 is used for the rural population, and the estimated populations for 1899 for all the larger cities and towns. This makes the total population approximately correct, as the rural population changes but little if any.

In Indiana and Michigan the populations for the towns could not be closely estimated, but the best figures obtainable were used.

The total population on the Maumee watershed is 612,206, of which 456,794 is in Ohio, 136,271 in Indiana and 19,141 in Michigan. As the total area is 6,344 square miles, the average density per square mile is 96.5. This includes rural and urban population.

A separation of the total population into urban and rural has been made, though but little value can be given the figures, except as they may show where pollution may be expected. All cities and villages with an estimated population of 1,000 or over for 1899 are classed as urban. This small figure was chosen so as to include in the urban population all villages that would have any sewage, or should have any. There are a large number of villages just within this class that have no sewerage but are just beginning to feel the need of some; and there are quite a number that have a fair proportion of sewage. If a larger figure were chosen there would be a number of villages classed as rural that have some sewage. The intention is to keep out of the rural population all villages, the inhabitants of which pollute the streams to which they drain more than the same number of isolated farm houses.

The total rural population on the watershed is 281,133 or an average density of 44.3. In Ohio alone this figure is 43.8, in Indiana 46.6 and for Michigan 42 2, showing considerable uniformity in the distribution of the rural population throughout the watershed in the different states. The urban populations are not so evenly distributed, the average per square mile in Ohio being 53.3, for Indiana 57.9 and for Michigan only 14 3, while the average for the whole watershed is 52.2.

In order to show the area of the various watersheds in the different states, the distribution of the total population in all the subdivisions, and the average population per square mile in all the divisions, the following tables have been prepared:

TABLE I—AREAS OF WATERSHEDS IN SQUARE MILES.

	Ohio.	Indiana.	Michigan.	Totals.
St. Mary river	427.54	356.08	....	783.62
St. Joseph river	225.46	662.87	243.96	1,132.29
Auglaize river	2,370.56	133 07	....	2,503.63
Tiffin river	574.16	....	94.87	669.03
*Maumee river	1,903.96	151.55	....	1,255.51
Maumee watershed	4,701.68	1,303.57	338.83	6,344.08

* Maumee river includes only the direct drainage to the river itself. Blanchard river drainage area = 924.17 square miles. Drainage area below Toledo water works = 101.63 square miles.

TABLE II—POPULATIONS ON WATERSHEDS.

	Ohio.			Indiana.			Michigan.			Totals.		
	Rural.	Urban.	Total.	Rural.	Urban.	Total.	Rural	Urban.	Total.	Rural.	Urban.	Total.
St. Mary river	18,268	6,300	24,568	22,160	3 595	25,755	....	....	....	40,428	9,895	50,353
St. Joseph river	9,277	3,170	12,447	26,755	9,521	36,276	10,000	....	10,000	46,032	12,691	58,723
Auglaize river	105,292	83,183	188,475	3,020	1,200	4,220	....	....	....	108,312	84,383	192,695
Tiffin river	23,409	6.503	29 912	....	....	....	4,300	4,841	9,141	27,709	11,344	39,053
Maumee river	49,832	151,560	201,392	8,820	61,200	70,020	....	....	....	58,652	212,760	271,412
Maumee watershed	206,078	250,716	456,794	60,755	75,516	136,271	14,300	4,841	19.141	281,133	331,073	612,206

Population on watershed below Toledo water works Rural, 5,175; Urban, 126,000; total, 131,175.

TABLE III—Average Population per Square Mile.

	Ohio.			Indiana.			Michigan.			Totals.		
	Rural.	Urban.	Total.	Rural.	Urban.	Total.	Rural.	Urban.	Total.	Rural.	Urban.	Total.
St. Mary river	42.8	14.8	57.5	62.2	10.1	72.3	....	....	....	51.6	12.6	64.2
St. Joseph river	41.2	14.1	55.3	40.8	14.4	54.7	41.0	....	41.0	40.7	11.2	51.9
Auglaize river	44.4	35.1	79.5	22.7	9.0	31.7	....	....	....	43.2	33.7	76.9
Tiffin river	40.8	11.3	52.1	....	....	....	45.3	50.9	96.2	41.4	17.0	58.4
Maumee river	45.1	137.3	182.4	5.8	40.2	46.0	....	....	....	46.7	169.4	216.1
Maumee watershed	43.8	53.3	97.1	46.6	57.9	104.5	42.2	14.2	56.4	44.3	52.2	96.5

Table No. 1 shows the area of the four principal tributaries in the three states, also the areas draining to the Maumee river direct, without first entering one of the large tributaries, while the totals represent the whole Maumee watershed.

Table No. 2 shows the distribution of the rural, urban and total populations on the various watersheds in the different states.

Table No. 3 shows the average population per square mile, urban, rural and total on the different divisions. This table is merely a combination of Nos. 1 and 2.

The total population for the Maumee watershed includes Toledo and the population drained by Swan creek. As this drainage enters the Maumee below the Toledo water works intake, it could very properly be excluded from the total watershed. The Maumee at Toledo is hopelessly polluted, and any addition will cause no harm, except as it pollutes the lake. No public water supply is endangered by the pollution. The total area of the watershed below the Toledo water works is 101.1 square miles, and has a rural population of 5,175 and an urban population of 126,000, or a total of 131,175. This would affect the average urban population considerably and should be borne in mind when referring to those figures. The average urban would drop from 52.2 to 32.8 per square mile.

These figures on the populations have been given to show where pollution is most liable, the more densely populated districts being more liable to pollution. A dense rural population is dangerous on any watershed, the run-off from which is used for a public supply. The average farm yard usually contains a manure pile, a hog pen and an outhouse, sometimes provided with a vault but frequently not, so that every rain washes the accumulated filth to the nearest water course. The pollution is not large and might not show in a chemical or bacteriological analysis, but just such isolated houses may spread any infectious water-borne disease which the inmates may have. And such diseases are prevalent in these houses due to the poor location and unsanitary condition of the wells.

POLLUTION.

In reporting on the specific pollution due to city sewage, objectionable manufacturing, etc., the Maumee river will be followed from its source up, noting all causes of pollution and bringing in each tributary watershed in the proper order. No attention will be paid here to the pollution of the river below the Toledo water works, as it bears no relation to public water supply and during the present order of things never will. No city or town will ever attempt to use Lake Erie near the mouth of the Maumee for a water supply. From the water works down the

Maumee seems to be dedicated to the public as an open sewer, and will probably continue so to be.

The public water supplies of all cities and towns will be described at the end of this report so as to make them more accessible and not to burden the body of the report.

SOURCES OF POLLUTION.

Lucas County Childrens' Home—Above the Toledo water works the first thing to pollute the Maumee is the Lucas County Children's Home. The institution has 110 inmates besides the officers and help. It has a water supply from the Erie canal and a complete sewer system discharging directly to the Maumee. There are eight cows, two horses and any number of hogs kept on the farm on the river bank. Any epidemic in this home would seriously endanger the Toledo water supply. which is taken from the river about five miles below.

Club Houses—For several miles above Toledo there are a number of club houses and fishing places which send considerable filth to the river especially during the summer season.

Perrysburg—Population 1,600. This village is on the east bank of the Maumee and sends its surface drainage to that river and to a creek which enters the river some miles below. There are no sanitary sewers in town or any objectionable manufacturing and the only pollution is from dirty streets and yards.

Maumee—Population 1,532. Maumee is just above and across the river from Perrysburg. It has no sanitary sewers and sends surface drainage only to the Maumee river and to the canal which passes through the town. It is quite a business town and will soon find sewers necessary. Both Perrysburg and Maumee have a few houses with private sewers to the river.

Grand Rapids—There is a state dam located at this village to feed the Miami and Erie canal. It is 1,610 feet long with a height of 5½ feet and backs the Maumee river up 19 miles, a little past Napoleon.

Bad Creek—This creek enters the Maumee 36 miles from its mouth. Bad creek drains Colton, Delta, Siney and Winameg, all classed as rural except Delta.

Delta—Population 1,451. Nearly all the streets of this village are tiled and some of these are used as sewers, carrying the drainage from kitchen sinks, a few vaults and three closets to Bad creek, which enters the river 12 miles away. This small amount of sewage from about 30 persons only, seems to cause no local nuisance. Along Bad creek are located an ashery, cheese factory and a large saw mill. These cause some nuisance from dumping refuse into the creek. The saw mill increases the organic matter with its piles of decaying sawdust. The ashery is in operation only in summer. It reduces wood ashes for potash and soda. The surface drainage is pretty bad from the filthy condition of the yards and alleys.

There are no regulations regarding the construction of vaults and they are built to suit owner, which means poorly built. Night-soil is generally hauled to the country, but some is buried on the premises.

Most of the private wells are drilled and from 80 to 90 feet deep, with some surface wells 12 feet deep. Some of the deep wells flow, in fact, the whole country is full of springs which keep up the summer flow of the creeks to a remarkable degree.

Creameries—Bad creek drains a grass country and small creameries are very numerous on its head waters. Some of these cause a local nuisance, unless the refuse is fed to hogs, and hog pens are not considered a nuisance.

South Turkey Foot Creek—This creek enters the Maumee and is 37 miles above the outlet. It drains the villages of Malinta, Hamler, Ridgeland, New Bavaria, Pleasant Bend and Holgate, all of which, except Holgate, are considered rural. These small villages may have a saw mill, a tile mill or grist mill, but they seem to add no more pollution to the stream than would a similar population on isolated farms. Hamler has a creamery draining to the creek.

Holgate—Population 1,500 This is a dull, spread-out village, with no paved streets, electric lights, water supply or sewers and not much business. The town site is very flat and poorly drained. The street drains empty into Brush creek, a branch of Turkey Foot. There are no vault or closet connections to the sewer.

Vaults are required to be built of brick or plank, but regulations are not enforced. A few dry earth closets are in use. Night-soil is hauled to the country. The industries consist of a grist mill, creamery and two stave factories. The creamery runs the year round and causes a nuisance in the summer from the decaying refuse, which is run to a hole in the ground. The slaughter houses are north of town, no killing being allowed within the corporation.

The wells are all driven and from 80 to 130 feet deep. The water is obtained just above or in the rock which lies at the above depth.

North Turkey Foot Creek—This creek drains a small watershed on which there are only the villages of Beta, Liberty Center and the town of Wauseon. It enters the Maumee river just opposite South Turkey Foot.

Wauseon—Population 2,210. This town is the county seat of Fulton county and has a public water supply from wells south of town, electric lights and sewers, but no paved streets.

There are 5¼ miles of tiling, almost all of which is used as sanitary sewers. These sewers empty both north and south into ditches which empty into Turkey Foot. The sewers give about 60 per cent. of the population access to them, but a much larger per cent. have drains for surface water only. There are 54 closets connected directly with the sewers and a few closets running to cesspools which are connected with the sewers, in all, the sewage from some four hundred and fifty people is carried to the creek. Owing to the large number of springs flowing to the ditches, the sewage causes but little nuisance except in the driest weather, then it is necessary to clean out and flush the ditches.

There are no vault regulations, a number of people having holes in the ground, which are covered when full, and some have no pretense of a vault. Most of the night-soil is buried in the country.

The industries consist of a grist mill, saw mill, two tile works and a creamery. The latter is on the ditch north of town and discharges all its refuse into same. It is too far removed to cause complaint, but it is very foul during dry weather.

Most of the private wells are drilled into the rock from five to 30 feet, and as the rock is from 165 to 180 feet down, the wells are quite deep. There are still left a few surface wells, these being about 35 feet deep.

(The public water supply is described at the end of the report)

Henry County Infirmary—A small run entering the Maumee just below Napoleon brings in the surface drainage from this institution. The buildings are old and have no sewer system. There are 50 inmates, attendants and the usual amount of stock on the place.

Napoleon—Population 2,543. This town is the county seat of Henry county and is situated on both sides of the Maumee river and about 35 miles from its mouth. The Miami and Erie canal also runs through the town. It has a public water supply from the Maumee river, paved streets, electric lights and some sewers. The town is kept up mainly by the fact that it is the county seat.

Both the sewers and surface drainage go to the canal and river. There are 2.8 miles of sewers with two outlets to the river and one to the canal. The upper outlet to the river is but a few rods below the water works intake, and as this point is in the back water of the Grand Rapids dam, there is great danger of contamination of Napoleon's water supply from its own sewage. The current in the river is very slight and can easily be influenced by the wind.

There are not more than 50 connections to the sewers, representing about 300 people. Owing to the large amount of water, the sewage causes no nuisance, except perhaps that flowing to the canal, which together with dirty surface water, causes some local complaint in hot weather.

Vaults are required to be water-tight, and must be 50 feet from wells. Quite a number of vaults are not so constructed, especially the old ones.

The river water is not much drunk, nearly every one using private well water. These wells are nearly all dug, and 25 feet or less in depth. A few drove wells get their water on top of the shale, about 60 feet down.

State Dam—Thirteen miles above Napoleon and five below Defiance, is a State dam to divert part of the Maumee to the canal. It is 400 feet long, 7 feet high, with flash boards 1 foot high, and backs the water up into Defiance.

Defiance—Population 9,759. It is the county seat of Defiance county, and is situated at the junction of the Tiffin and Auglaize with the Maumee river. The surface drainage of the city is to all three rivers, but the sewers empty into the Maumee and Auglaize rivers only. The Miami and Erie canal also passes through the city and receives some of the surface drainage. Defiance has a great deal of street paving, electric lights, water supply, and at one time had street cars. Its water works is owned by a private company, and the water is taken direct from the Maumee just above the entrance of the Tiffin river.

There are 11.93 miles of sewers, giving some 60 per cent. of the population access to them. The sewers empty into the rivers at the most convenient place; 12 going to the Maumee and five to the Auglaize, also a ditch which empties into the latter river. There are about 250 connections to the sewers, which send the sewage of some 1,500 people direct to the river. A few vaults and cesspools are connected to the sewers also, but they are not allowed.

There are no vault regulations, and the vaults are poorly constructed. This is very bad, as the hydrant water is not drunk at all, and the city depends entirely upon surface well water. The wells are shallow, only 8 to 30 feet deep, getting the water in a bed of gravel just under the surface soil.

The principal industries are hoop and heading factories, carriage and wagon shops, strawboard works, woolen mills and a stove foundry. The woolen mill and strawboard works discharge their refuse into the canal, which joins the river here.

Auglaize River—This river brings in the drainage of Ada, Bluffton, Columbus Grove, Continental, Delphos, Dunkirk, Findlay, Forest, Lima, Ottawa, Paulding, Payne, Spencerville, Van Wert and Wapakoneta, all of which are considered as urban; also any number of small villages that are classed as rural.

Continental—Population 1,500. This village has a public water supply from wells, and electric lights, but no paved streets or adequate sewer systen. The storm drains empty into Powell creek and Blanchard river. There are several closets connected with the drains to Powell creek. The village has no health officer and every thing is in very poor condition. Vaults are filled and covered with dirt, slaughtering is done in town, and offal is fed to hogs, many of which are kept within the corporation. There are but few private wells in town, nearly every one using the hydrant water. The few wells are drove and go to the rock 40 feet down.

Flat Rock Creek—This is the second creek bringing urban drainage to enter the Auglaize river. On this watershed are the towns of Paulding and Payne in Ohio, and Monroeville in Indiana, together with several small villages.

Paulding—Population 1,900. This village is the county seat of Paulding county. It is situated on Flat Rock creek and nine miles from where it enters the Auglaize river.

Paulding has paved streets, electric lights, but no public water supply or sanitary sewers. Many of the streets are sewered to the creek, but for storm water only, no closets or vaults being allowed to connect. Notwithstanding this, there are a few cesspools in town with connections to the storm sewers, one from the hotel causes considerable nuisance in the summer. The jail has flush closets sewered to the creek, and the school house has a cesspool which drains there also. Thus a variable population is sewered to the creek, depending upon the number of inmates in jail, and also if the school is in session or not. During the summer the sewage of not more than 50 people enters the creek.

There are no vaults in town, the box system being used almost entirely. Night-soil is buried just northeast of town and near the creek.

The town has no industries beyond the tile and saw mills.

Private wells are nearly all drove and drilled, getting their water a few feet down in the limestone which lies 30 feet below the surface.

Paulding County Infirmary—This institution is two miles northeast of Paulding, near Flat Rock creek. It is an old place, with no modern improvements, and has some 54 inmates.

Payne—Population 1,500. This town is on Flat Rock creek, 12 miles by water above Paulding. It has no paved streets, electric lights, water works or sewer system. The town site is very flat, and the streets have to be well tiled to carry off the surface water. These drains empty into Flat Rock, which gets all the surface water of the town. Closets and vaults are not allowed on the sewers and none were found. Most of the drains are too shallow to drain the cellars, and none of these conveniences are used, as the ground water is very near the surface.

It is estimated that one-fourth of the town use boxes in the outhouses, the rest having vaults. Night-soil is buried west of town. There is some slaughtering done in town which has caused a nuisance.

The industries are several saw mills, tile mill and an ashery. The latter runs only in the summer.

Monroeville, Indiana—Population 1,200. This town is 12 miles above Payne on Flat Rock, to which all its drainage goes. It has no sanitary sewers or closets connected with the drains.

Little Auglaize River—This river joins the Auglaize 20 miles above the mouth of the latter at Defiance. It drains nearly all of Van Wert county and part of Paulding. The only town that can be classed as urban in this whole district is Van Wert, all the rest being small villages, supported by the country around and a few tile and stave mills. Nearly all the timber has been cut away and the lumber interests are dead. This has stopped the growth of the villages, and in some cases nearly depopulated them.

Van Wert—Population 7,000. This town, the county seat of Van Wert county, has paved streets, electric lights, a public water supply from wells, but a poor sewer system. In fact nearly all the sanitary sewers are semi-private affairs. In all there are 4.2 miles of sewers. This includes public and private. These have 13 outlets to Town creek, which runs through the city, and have some 60 closets connected with them, and carry to the creek the sewage of some 400 people, as one sewer is from the hotel.

All water closets that are connected with the sewers or with the sewer itself must have cesspools. This keeps all the solid matter out of the creek and prevents deposit of sewage in its bed. The sewers cause a nuisance in the summer when the creek goes dry, and their outlets have to be limed to make the creek bearable. There are a number of vaults that are drained by the sewers; in fact a town ordinance requires that all vaults be so drained, unless said vaults are water-tight. Most of the vaults are water-tight and kept cleaned out. Night-soil is taken to the city dump and buried. This dump is one mile southwest of town and drains to Maddox creek, a branch of the Little Auglaize river.

The private well supply is from shallow dug and drove wells principally; these wells are 16 to 24 feet deep, and get their water in a bed of quicksand just below the clay soil. A few drilled wells go to the rock.

The manufacturing products are pianos, potash, doors and sashes, carriages, wood work, oil well supplies, tiling, etc. None of these seem to cause any nuisance.

Van Wert County Infirmary—This institution is four miles east of Van Wert, near Dog creek, a branch of the Little Auglaize. It has a water supply and a sewerage system, the latter going through a small ditch to Dog creek. There are usually about 30 inmates at the place.

Blanchard River—This stream enters the Auglaize river from the east and 24 miles above Defiance. It has a watershed of 124 square miles and drains nearly all of Hancock and parts of Hardin, Allen and Putnam counties. On its watershed are located the towns of Bluffton, Dunkirk, Findlay, Forest and Ottawa, with the usual array of small villages.

Ottawa—Population 1,978. This town is the county seat of Putnam county. It has paved streets, electric lights, but no water supply or adequate sewer system. The town is located on the north bank of the Blanchard river and south of Towe run, its surface drainage and sewage going to both.

All public sewers are for storm water only and house connections are not allowed, though it is said that a few have slipped connections in. There are several private sewers with one or two connections each emptying into the river, three of these emptying into the "Swale," an old channel of the river. This "Swale" is full of stagnant water, and the sewage and the wash water from a steam laundry cause it to become a nuisance in summer. A saw mill on the banks of this place has drained the mouth of it so as to have water for its work and the water in the "Swale" is never changed except during high water when the river clears it out. This old river bed is a menace to the health of the community, and should be filled up or cleaned out and drained.

The court house and jail have private sewers to Towe run, which enters the river just west of town. In all, the sewage of about 150 people finds its way to the river.

Vaults must be water-tight and 50 feet from a well, but these regulations are not enforced, and vaults are constructed to suit the owner. There are a few dry earth closets in use. Night soil was formerly buried in a dump just west of town, but the lease has expired and it is now buried anywhere.

On the east side of town nearly all the private wells are drilled from 50 to 190 feet deep and strike the rock from 40 to 90 feet down. The west side wells are dug from 10 to 20 feet deep and find their water in a sand vein.

The industries consist of wheel and spoke factories and two creameries. All these are on the banks of the river and send their waste directly into it Quite a number of hogs are kept within the corporation limits, being tolerated until complained against.

Putnam County Infirmary—This institution is five miles northeast of Ottawa. It has a water supply from a 90-foot drove well, and pumped to tanks by wind engines. There are three water closets in the building and three outdoor vaults, all connected to an 18-inch sewer, which empties into a ditch three-fourths of a mile away, and this empties into the Blanchard river one-half mile below. There are 52 inmates in the place, which is a fair average.

Bluffton—Population 1,400. About three miles above Ottawa the Big Reilley creek brings in the drainage from Bluffton, some 15 miles up the creek. This town has a public water supply from wells. It has electric lights but no sewers or paved streets.

Quite a number of the streets are tiled to the creek, but no connections are supposed to be made with the drains. One of the hotels, however, has a drain from the vaults to these storm sewers. There are about 10 water closets in town which have private sewers to the creek. Vaults are required to be 75 feet from wells, but the regulation is not enforced. Vaults are usually built of stone or brick, but not water-tight; quite a number of boxes are used. Night-soil is removed to any convenient place.

Most of the private wells are drilled a few feet into the rock, which lies from 12 to 20 feet below the surface. The industries consist of a few saw and grist mills, also a creamery, but that is not running now.

Findlay—Population 20,000. Findlay, the county seat of Hancock county, lies on both sides of the Blanchard river and 40 miles from its mouth or junction with the Auglaize. The town has paved streets, electric lights, street cars, a fair sewer system and a public water supply from the Blanchard river.

The surface drainage and sewers go to Eagle creek and Blanchard river. A small run entering the river on the north drains part of the the town. There are 12.2 miles of sewers, giving about 50 per cent. of the population access to them. With these nearly 500 water closets and vaults are connected, representing about 3,000 people. The sewers have four outlets to Eagle creek, and five to Blanchard river. The sewage entering the river seems to cause but little nuisance, but that going to Eagle creek causes a good deal of trouble during low water The creek goes nearly dry in summer, and the sewage collects in the pools where it decays, causing very foul odors. A greater part of the year the creek does not contain water enough to carry off the sewage deposits, and this leaves the bottom of the creek covered with a filthy black mud. One sewer with about 30 connections, empties into an old quarry near the T. & O. C. tracks. This pond has no outlet, but the sewage causes no nuisance, as the water seems to be changed through underground ch nels. The greatest objection to this as a dumping place for sewage is the danger of the contamination of the ground water.

Vaults are not water-tight, and are constructed to suit the owner. They must be cleaned at least yearly, and the night-soil taken to the country and buried. There are quite a number of dry earth closets in use. Garbage is cremated, as is also a little night-soil.

The private well water is drunk a good deal, especially when the river water is muddy or the reservoir is low and the water smells. These wells are both drove and dug, the water being obtained for both kinds in or just above the rock, which varies from on the surface to 30 feet below it.

A glycerine factory northeast of the city, sends its waste, principally sulphuric acid, to the Blanchard river through a combined ditch and sewer, which enters the river just below the water works dam. Another glycerine factory was found to send some refuse to the river above the water works, polluting the public water supply.

The principal manufacturing establishments are a glass works, potteries, nail works, wood working shops, etc. There is also a brewery which sends its waste direct to the river through a short sewer. There is a grist mill 2½ miles below town, which uses water power furnished by the Blanchard river. Its dam is 200 feet long and 5 feet high, backing the water up into the city.

Forest—Population 1,267. This town has electric lights, but no paved streets, sewers or public water supply. The drainage is north to a swamp drained by the Blanchard river and south direct to the same river. There are a number of tile drains in town, but not enough to carry off the surface water. During heavy rains the sewers back the water up and flood the few cellars drained by them. There are no closets or vaults connected with the sewers. The old vaults in town are planked or in some cases mere holes in the ground, but the new ones must all be brick, or boxes have to be used. Night-soil is hauled to the nearby farms.

Most of the private wells are drove to the limestone, 70 to 80 feet down, then drilled a few feet into it. The rock is overlaid by a thick layer of blue clay.

A creamery in town has a connection for waste water to the storm drain which empties direct to the river. This creamery runs the year round, and the drains become a nuisance in hot weather. In fact the ditches and drains all give trouble in summer unless carefully cleaned out, owing to their very flat grade. The one slaughter house is outside of the village, its offals are fed to hogs.

The only industry in town is a steel roofing plant, employing about 30 men.

Dunkirk—Population 1,143. This town has no paved streets, water works or adequate sewer system. The drainage goes to "Shalley," and this to the Cessna branch of the Blanchard river. The streets are well tiled and the drainage good. The ground water is low here owing to a large quarry, 20 feet deep, just southeast of town. There are no closets or vaults connected with the drains.

Vaults are constructed in any way to suit the owner, brick, plank, boxes or none at all. Night soil is hauled to the farms.

Most of the wells are drilled from 30 to 80 feet deep, entering the limestone eight feet below the surface. There are no surface wells, as it is necessary to go below the quarry level to get water.

There are a great many hogs kept in town and no objection is made to them unless they are complained against. The industries consist of a grist mill, saw mills and planing mill.

Ottawa River—This river joins the Auglaize about 29 miles above Defiance. It drains parts of Putnam, Allen and Hardin counties, with the towns of Ada, Columbus Grove and Lima.

Columbus Grove—Population 1,982. This town has electric lights, but no paved streets, water works or adequate sewerage. Its surface drainage is to Plum creek into which the principal street tiles empty. These sewers drain the streets, cellars and kitchen sinks, but no water closets. The opera house and a few dwellings have private sewers to the creek but the total population sewered will not exceed 50. It is estimated that one-half of the town use boxes, the rest plank vaults. Night-soil is hauled to farms.

One half of the people in the village use surface wells not more than 10 feet deep, the water coming from a bed of quicksand. It is claimed that the other half is supplied by 15 drilled wells which are 115 feet deep and strike the limestone 30 feet down.

Hogs are allowed in town if no complaint is made. Slaughtering is done along Plum creek and offals fed to hogs.

The industries consist of the manufacture of staves, heads, brooms, tile and the packing and shipping of chickens. This is done in town and causes a good deal of trouble in preventing a nuisance.

Lima—Population 31,000. Lima is the county seat of Allen county and the next to the largest city in the northwestern part of the State. It has many miles of paved streets, electric lights, good street car service, a public water supply and a fair sewer system. The public water supply is from wells and a small creek east of town, not influenced by the city sewage.

Lima has about 25 miles of sewers, combined system, with 18 outlets direct to the Ottawa river and 10 to small ditches that flow to the river. About 75 per cent. of the city's population has access to the sewers and there are 2,500 connections with them, or the sewage of some 15,000 people enters the river. Below the city the Ottawa river is very foul and dirty and gives off a horrible stench. Part of this nuisance was caused by the effluent of a paper mill, which has burned down since the inspection. Formerly the river was very filthy within the city limits but it has been straightened and deepened so that all the sewage is carried below and most of the nuisance is abated within the city.

There are a large number of vaults within the city, very few of which are water-tight. It is estimated, however, that three-fourths of the outdoor closets are of the dry earth pattern. Night-soil and garbage is buried on the city dump grounds.

Most of the private wells are drilled, going into the rock which is but a few feet down. There are still a few shallow surface wells in use.

There are quite a number of ponds within the city limits, some of these being old abandoned quarries. There are two parks which have quite large lakes for pleasure purposes, these are filled by surface water. A large refinery has reservoirs for its own water supply. These small bodies of water, with the exception of those which are too small to be permanent, drying up in the summer, seem to cause no nuisance.

Lima has several railroad shops, machine shops, car works, iron works, flour mills, a tannery, etc.

Allen County Children's Home—This institution is three miles southeast of Lima. It has a complete sewer system, with an outlet to the Ottawa river. It has about 70 inmates.

Allen County Infirmary—This place is two miles east of Lima, on the Ottawa river, to which it is sewered. It has about 75 inmates.

Ada—Population 2,415. Ada is a college town with a permanent population as above, and a floating student population of about 1,500. Its drainage is to two runs which empty into "Hog" creek or the Ottawa river. There are 2½ miles of sewers and a number of drains which empty into the uns above mentioned. No closets or vaults are allowed on the sewers, which are used for storm water and cellar drainage only. A few kitchen sinks are connected, and it is claimed a few vaults are also drained to them.

Vaults are constructed in any way to suit the owner, usually of plank or brick. Night-soil is hauled to farms outside of the town. Garbage is fed to hogs in the village.

The drains cover the place pretty well and keep the ground dry, but they are not adequate for heavy storms. Both of the small runs and Hog creek are dry in the summer and sewage could not be emptied into them without some treatment beforehand. Hog creek is now being deepened and straightened to drain Hog creek marsh east of town.

One-half of the private wells are drilled into the rock, which is 20 to 24 feet down. The rest are dug wells, which get their water on top of the rock.

The industries consist of a flour mill, turning and planing mill and a machine shop.

It must be noted that none of the college buildings have water closets, depending upon outdoor vaults entirely.

Delphos—Population 4,100. This town, lying both in Van Wert and Allen counties, has paved streets, electric lights, a water works, but not enough sewers. The water supply is from drilled wells just southeast of town.

Its drainage is to Jennings creek, to Flat Rock creek, a branch of the above, and to the Miami and Erie canal, which passes through the center of town. Jennings creek joins the Auglaize river 36 miles from Defiance. The town is fairly well sewered to both of the above creeks, five outlets to Jennings and three to Flat Rock. Only one of these sewers, the Main street sewer, emptying into Jennings creek, has any closet connections. This sewer runs the length of Main street, the business street of town, and has about 10 water closets connected with it. The paper mill north of the town also runs its wastes to this sewer. It is claimed that this sewer causes no nuisance, but from the size of the creek and from the amount of sewage it must be objectionable during low water unless the canal aqueduct leaks enough to keep it flushed out. The rest of the sewers are for storm water only and have no closet or vault connections. Any kind of a vault is used and none are water-tight. Night-soil is hauled to the country and buried.

Private wells are not used much. The few in use are mostly drilled into the limestone, 12 to 14 feet below the surface, and are from 60 to 70 feet deep. A few wells get the surface water above the rock.

A brewery discharges its waste through a private sewer to Flat Rock, and makes it so offensive that in dry weather the creek has to be flushed from the canal.

The industries of the town are wheel and handle factories, planing mill, paper mill, brewery, grist mill and small railroad shops.

Wapakoneta—Population 4,000. This town, the county seat of Auglaize county, is situated on the Auglaize river 64 miles from its mouth. It has paved streets, electric lights, a public water supply, but no sewer system. The water supply is from wells in the northeastern part of town.

The storm water drains empty into the Auglaize river, which passes through the town. There are not supposed to be any closets connected with these, but it is said a few are and the outlets of same would indicate it. The jail, court house and two schools have closets which are sewered to the river. Also quite a number of private houses have sewers to the river and a number of vaults are built close to the river bank, so that every rain washes the contents into the river. In all some 250 people are sewered to the river, besides the varying population of the jail and some one thousand school children. During dry weather the river gets very low and the sewage accumulates, causing a nuisance. As the construction of vaults is not regulated, none of them are water-tight. Night-soil is hauled to the farms.

Private wells are both dug and drove, but all are only from 14 to 35 feet deep, obtaining their water in a bed of gravel at the river level.

The industries are a handle factory, machine shop, furniture factory, churn factory and bottling works. The latter has a sewer to the river.

Auglaize County Infirmary—This institution has about 50 inmates, and is north of Wapakoneta and back from the river. It has no sewerage system and depends upon outdoor vaults.

The head waters of the Auglaize river are badly polluted by waste from the oil fields.

Tiffin River—This river enters the Maumee from the north and about a mile-and-a-half above the outlet of the Auglaize river, both rivers joining the Maumee within the city limits of Defiance.

The Tiffin river drains parts of the counties of Henry, Defiance, Fulton and Williams in Ohio and a small portion of Lenawee county, Michigan. The only towns on its watershed classed as urban are Bryan, Stryker and West Unity in Ohio and Hudson and Morenci in Michigan. Its rural population is up to the average and made up of a well-to-do class of people, engaged in dairying and stock raising to a large extent.

Bryan—Population 3,176. This town, the county seat of Williams county, has electric lights, a public water supply, but no paved streets or adequate sewer system. The water supply is from wells in the southeastern part of town. The drainage of Bryan is to two runs which empty into Beaver creek a branch of the Tiffin river. The streets are well tiled and drained for storm water, except for the heaviest rains, then they are not large enough and cellars are flooded. These drains are not supposed to carry sewage, but about 10 closets and five cesspools have been connected with them. The northern part of the town is drained to a county ditch and the southern part to Lynn run. These join just west of town and go to Beaver creek. These ditches are supplied to a large extent by spring water and the small amount of sewage seems to cause no nuisance. Even the local brewery and creamery, which drain to Lynn run, have not been complained of.

Vaults are not water-tight, and are built of stone, brick or plank to suit. Night-soil is hauled to a dump one and one-half miles west of town near Lick creek.

There are only a few surface wells in town, most of the wells being drove and from 90 to 140 feet deep. Many of the deep wells are artesian, as are the wells for the public water supply.

The industries of the town are the creamery and brewery above mentioned, a grist mill, agricultural works, brick and tile works, wheelbarrow works, planing mill and two large hay barns.

Stryker—Population 1,017. This spread-out country village has no paved streets, electric lights, sewers or public water supply. Its drainage is west to the Tiffin river about one-half mile away. Nearly all the streets are tiled, but no closets or vaults are connected with these. Vaults are supposed to be water-tight, but most of them are planked only. Night-soil is buried west of town.

There are no surface wells in town. All are drove and from 115 to 135 feet deep. These wells get their water in shale lying above the limestone. The industries of the town are hoop, stave and oar factories, lumber yards and a tile mill.

West Unity—This town claims 1,000 people, but hardly has it. It is on Leatherwood creek, a branch of the Tiffin river above Stryker. Its streets are drained to the creek, but there are no sanitary sewers. The wells are all shallow, getting the surface water only. The industries are a woolen mill, creamery, grist mill and wood working.

Morenci, Michigan—Population 2,665. This town has no sewers or water supply, but it is situated directly on the Tiffin river, and all of its surface drainage goes to that stream.

Hudson, Michigan—Population 2,176. This village has a public water supply and about two miles of sanitary sewers which empty into the Tiffin river. There are 132 water closets in use, representing the sewage of about 800 people. It is claimed that the sewage causes no nuisance.

Hicksville--Population 3,569. This town is on the head waters of Gordon creek, which enters the Maumee 76 miles from its mouth at the bay. It has electric lights, a public water supply from wells, but no paved streets or adequate sewer system.

There is over a mile of tiling going to Mill creek, a branch of Gordon, which is used for storm water, cellar drainage and kitchen sinks only, though one closet is said to be connected. There are but few vaults, and these are comparatively tight; most of the outhouses have no vaults whatever. Night-soil is dumped on a farm west of town near Mill creek. The private wells are principally drilled or bored and from 25 to to 130 feet deep, going through the surface soil and clay, finding water in a deep bed of gravel. There are still a few dug wells in use. Many of the deep wells are artesian and furnish an excellent water. The town has practically no industries outside of a hoop factory.

Antwerp—Population 1,383. This town is right on the bank of the Maumee and 90 miles from its mouth. It has no paved streets, water supply or sewers. There are a few tiles laid to the river and ditches for storm water, but no closets are connected. Vaults are merely holes in the ground, which, when full, are covered over and new ones dug. Some of the night-soil is buried in the low lands near the river. The private wells are driven to the rock, which is 40 to 50 feet down. Still a few dug wells in use; these are only 16 to 18 feet deep. The old abandoned Wabash canal is not yet filled up and causes a nuisance in the summer on account of the rubbish thrown into it. Hogs are kept in town and some of the pens are in bad shape. The slaughtering is done west of town on the Maumee river.

The only industries in town are the usual saw, grist and tile mills.

Fort Wayne, Indiana—Population 50,000. This town is situated at the point where the St. Mary and St. Joseph rivers join to form the Maumee river. It has all the modern improvements of a city, with a good water supply and a fair sewer system. Its sewers are accessible to to 60 per cent. of the people, and fully 50 per cent. of these have connections. This gives about 15,000 people the use of the sewers. There are six main sewer outlet- to the St. Mary river, four to the Maumee and none to the St. Joseph river. These sewers empty both above and in the city limits and cause a great deal of complaint in the summer time. An orphans' home with 50 inmates and an infirmary with 200 inmates are sewered to the St. Mary river just above the city. Four large packing houses and reduction works are on the banks of the river and send all their waste to them. A gas works, tannery and brewery are sewered direct to the river. Quite a number of large shops have their outhouses for employes on and over the river banks. The worst thing of all, however, is the night-soil. That is dumped over the Maumee river bank about two miles below the city. Thirty-five thousand people are not connected to the sewers and have to depend upon vaults. At the usual figure, this would give 7,000 barrels of night-soil that must be dumped into the river annually. The Maumee is so polluted below town that it will not freeze, and with eight inches of ice on the river above the sewers and dumps.

St. Joseph River—This stream drains part of Williams and Defiance counties in Ohio, and part of Michigan and Indiana. On its watershed are the towns of Montpelier and Edgerton in Ohio, and Waterloo, Butler, Garrett and Auburn in Indiana. The watershed in Michigan contains no urban population.

Garrett, Indiana—Population 3,500. This town has both sanitary and storm sewers and a public water supply. The sewers empty into Cedar creek, which gets all the surface drainage. There are about 200 connections to the sanitary sewers, representing about 1,200 people. Of these 200 connections, 50 are for water closets and the rest for vaults and cesspools. The town is a railroad division point and its business depends upon this.

Auburn, Indiana—Population 2,427. This town has no water supply or sewers whatever. Its surface drainage is to Cedar creek, a branch of the St. Joseph river.

Waterloo, Indiana—Population, 1,600. This town has no water supply or sanitary sewers, but has a fair system of storm water drains which empty into Cedar creek and into ditches leading to it. There are six or seven closets connected to one of these storm drains which cause a nuisance in the summer when the water is low in the creek. The only manufacturing in town is the usual saw and grist mills.

Butler, Indiana—Population 2,700. This town has a public water supply, but no sanitary sewers. There are a few storm water drains which empty into a small run which empties into the St. Joseph river. There are a few water closets connected to the drains, but the small amount of sewage seems to cause no nuisance. The manufacturing products are bicycles, windmills, baskets and canned goods.

Edgerton—Population 1,170. The village has no paved streets, water supply, electric lights or sewers. Some of the streets have tile drains emptying into the St. Joseph river, which runs just east of town. There are no closet connections to these drains, every one depending upon vaults. These are mostly built of brick or stone and some are water-tight; a few have no vault or pit whatever. Night-soil is hauled south of the village to a farm through which the river runs.

The private wells are mostly driven, but only 14 to 25 feet in depth; they get their water in a bed of gravel which starts only two feet below the surface. There are two slaughter houses not far from the river, but the refuse is fed to hogs, quite a number of which are kept in town. The industries of the place consist of a basket and handle factory and a saw mill.

Montpelier—Population 2,000. Montpelier has a public water supply from wells and electric lights, but no paved streets or sewer system. Most of the streets have tile drains emptying into the St. Joseph river and a small run which empties into the river. There are two closets and several cesspools connected to the sewers, but no vaults are allowed. It is claimed that the sewers never cause a nuisance, and that there is always some water flowing in the river. The majority of the vaults are merely shallow holes in the ground, these being cleaned out twice a year. Night-soil is hauled to farms west of the village.

The majority of the private wells are drove and from 40 to 50 feet deep, the water being found in a bed of gravel and quicksand below the clay. A few dug wells get water from gravel only eight to 20 feet down. The slaughter houses are one-half mile west of town near an old channel or bayou of the river. The refuse is discharged to this, causing a nuisance in the summer time.

The industries consist of a brick yard and lumber mills. There is also a small creamery on the bank of the river, to which all its waste is sent.

St. Mary River—This river drains parts of Van Wert, Mercer and Auglaize counties in Ohio and parts of Adams, Allen and Wells in Indiana. The only urban population on its watershed in Ohio is St. Mary and in Indiana, Decatur.

St. Mary's—Population 3,500. The village of St. Mary's lies on both sides of the St. Mary river and three miles east of the Grand reservoir which feeds the Miami and Erie canal, which also passes through the town. The village has paved streets, electric lights and a public water supply, but no sewers. The water supply is from wells situated within the corporation. The drainage is to the canal and river, all the street drains emptying into the latter, however. There are no connections to the storm water drains and none are allowed. Several families have cesspools which are cleaned out in barrels, except when they dump them into the gutters as it is claimed. Several of the larger houses near the river have private sewers to it, the hotel also has one. Vaults are required to be water-tight, but very few are so constructed. Night-soil is hauled outside the corporation line and dumped anywhere.

Private wells still supply most of the drinking water as the public water supply is not generally introduced as yet. Most of the wells are dug and from 10 to 50 feet deep, the water being found in quicksand near the surface, or in clay farther down. The limestone is 125 feet down and a few drilled wells get their water in this.

A small woolen mill and a paper mill discharge their refuse to the canal. It is claimed that the paper mill sends waste to the river at times. The other industries of the town are a chain works, spoke factory, oil well supplies and flouring mills.

During dry weather the St. Mary river gets very low and the small amount of sewage and waste emptied into it causes considerable nuisance. Hogs are kept, many of the pens being built right on the river bank, and these add to the filth of the stream.

Decatur, Indiana—Population 4,500. Decatur has a public water supply and some sewers. The latter empty directly into the St. Mary river. It is estimated that there are about 250 connections to the sewers representing some 1,500 people.

SUMMARY.

From a total urban population of 331,073 on the Maumee watershed, 101,000 have connections to the sewers. Most of this sewage is from indoor water closets, very few places allowing vaults to be connected to the sewers, and cesspools are not common. Sixty thousand of these 101,000 people having sewer connections are in Toledo, and thus have nothing to do with the pollution of the watershed. This leaves 41,000 people, the sewage of which reaches the Toledo water works. Some of this travels over 200 miles, while that from the Lucas county home has only five miles to go.

In but few places, near the center and lower end of the watershed, is the sewage a nuisance, owing to the large amount of water always flowing in the rivers. Fort Wayne, 123 miles above Toledo, is the nearest place where the sewage is considered a nuisance. In many of the towns located near the edge of the watershed, however, the sewage causes a good deal of trouble during low water. This sewage from these out-of-the-way places probably affects but little the purity of the water in the lower part of the Maumee, as it has so far to travel in small streams and rivers where the chances for purification are the best. It is the sewage of Fort Wayne, Defiance and Napoleon that causes the most pollution of the public water supplies. Findlay and Lima may also influence this some, but the chemist and bacteriologist will have to explain their effect, as all visible pollution is destroyed long before the Auglaize joins the Maumee. In fact the sewage of Fort Wayne and Defiance is soon lost sight of in the large volume of the Maumee, but the short distance and the nature of the stream must prevent complete purification before the river is required to furnish a public water supply.

The population using the sewers is divided among the different rivers as follows:

Auglaize	19,900
St. Mary	1,700
St. Joseph	1,400
Tiffin	1,000
Maumee direct	67,000
Sixty thousand of the 67,000 is in Toledo.	
Total number of people in Maumee watershed	101,000

PUBLIC WATER SUPPLIES OF THE MAUMEE WATERSHED.

There are 15 cities and towns on the Maumee watershed in Ohio that have public water supplies. Of these, ten use deep well water, four use river water and one uses well and surface water. This would seem to make the pollution of this watershed less important than one in which the surface water is more generally used for public water supplies, but unfortunately three of the towns that use the river water are on the lower part of the Maumee river, where they get full benefit of all the accumulated pollution of the watershed. Were it not that the water purifies itself to a greater or less degree during its flow, these towns would have a water supply so polluted that it would be absolutely unusable. These three towns, Defiance, Napoleon and Toledo, also represent 140,000 people or 56 per cent. of the total urban population on this watershed in Ohio. These, together with Findlay and Lima, which use surface water not contaminated with the accumulated filth of their neighbors, represent 191,000 people or 76 per cent. of the urban population on the Ohio part of the watershed. Thus, while the surface water supplies are few in number they represent a large number of people.

The 10 small towns near the edges of the watershed that could get good surface water with some care are so located as to be able to and prefer to get a deep well water which is not susceptible to surface contamination. The towns using this well water are Bluffton, Bryan, Continental or Marice City, Delphos, Hicksville, Montpelier, St. Mary's, Van Wert, Wapakoneta and Wauseon.

Lima has a surface supply from Lost creek, augmented by well water.

Surface Water Supplies.

Defiance—Population 9,759. The Defiance water works is owned and operated by a private company. The franchise was granted the company in 1887 and the plant put in operation in 1888. The franchise is for 30 years, with a clause permitting the city to purchase after 10 years and at the end of any five years thereafter.

It says the following regarding the kind of water to be furnished:

"The water shall be taken from such a point as shall be free from all sewage contamination, and shall be taken from a crib or well, and shall at all times be a good, wholesome water, fit for all purposes of domestic and manufacturing uses."

The water is at present taken from the Maumee just at the southern corporation line and above all local contamination from sewage. The nearest serious pollution of the river being Fort Wayne. The water is not used for domestic purposes at all, its muddiness for at least six months in the year being the principal objection to most of the people, though some complain of Fort Wayne.

The water is pumped from the river to a standpipe by two horizontal, compound, condensing, duplex Blake pumps of 2,000,000 gallons capacity each, which were put in with the works and are in fair condition now. The standpipe is 140 feet high and 20 feet in diameter, giving a capacity of 329,000 gallons. The ordinary pressure is 55 pounds.

There are 18 miles of mains, which give about 65 per cent. of the population access to the water. There are 540 services, of which only about 450 are in use and 27 of these metered. The average daily consumption is about 900,000 gallons and the average for each consumer is about 300 gallons.

The annual water rates are as follows:

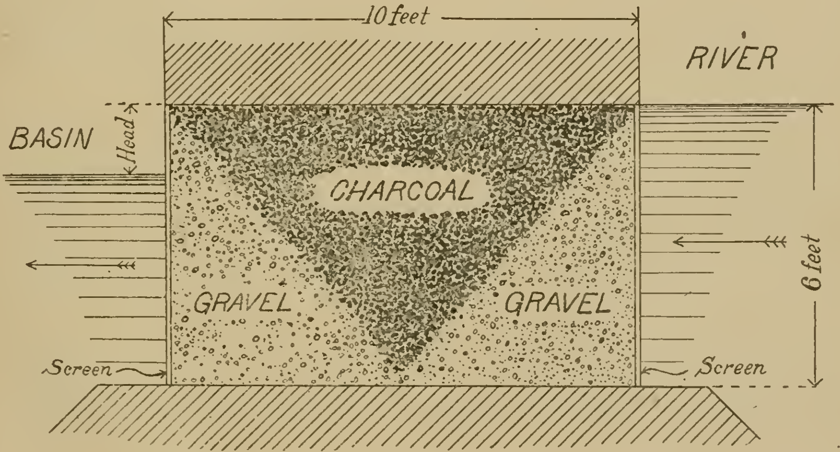
Five room dwelling	$5 00
Each additional room	1 00
Private bath tubs, hot	5 00
" water closets	3 00
" stables, one horse and carriage	2 50

Meter rates per 1,000 gallons:

Below 1,000 gallons per day	40
Two thousand to 3,000 gallons per day	30
Above 10,000 gallons per day	15

Findlay—Population 20,000. The water works was put in by the city in 1889 and has cost to date about $333,000. The water is admitted to a basin from the Blanchard river through a filter-wall separating the reservoir from the river. The water stands in the basin at the river level minus the friction in passing the filter. Just below the basin entrance a dam has been built across the Blanchard river to keep the level of the water up during dry weather. This dam is 200 feet long and eight feet three inches high, backing the water up some three miles.

The filter is built in the openings between the arches of a masonry bridge or dam across the end of the reservoir. This wall is 295 feet long and the supports for the arches take up 116.5 feet leaving 178.5 feet for the length of the filter proper and as the filter is six feet deep the filtering area is 1,071 square feet. For a section of the filter see cut. The filtering media is 10 feet thick, the two outside layers being composed of gravel and the inside of charcoal. The gravel is kept in place by screens across the openings under the arches. In filling the filter the gravel was banked against the screens as much as possible and the intervening wedge filled with charcoal; thus the lower part of the filter contains but little charcoal, and as this makes the friction the least near the bottom, most of the water must pass through only gravel giving but little purification.



SECTION OF FILTER-WALL
FINDLAY OHIO

State Board of Health
B.H.Flynn 1898

The filter was designed to free the river water from some of its mud and it does this to a considerable extent. The filter is cleaned three times a summer by pumping water through it. The rate of filtration is controlled by gates that can be raised or lowered over the openings between arches. Originally sand was used instead of charcoal and the change was made in 1897.

The water in the basin never appears to be muddy but during low water a scum gathers on its surface and the water smells some. The reservoir is cleaned every other year by draining the water out and by flushing and scraping out the mud. The water is pumped direct from the reservoir to the mains by two horizontal, compound, duplex Gordon pumps of 2,500,000 gallons capacity each. The average daily consumption is 900,000 gallons, allowing 5 per cent. for slip, and the average for each consumer is 140. The average pressure is 70 pounds.

There are about 27 miles of mains, giving 60 per cent. of the population access to the water. There are 1,493 services, of which only 1,036 are in use and 114 of these metered. During the summer when the reservoir is low the public water is not drunk very much and private wells supply most of the water for domestic purposes.

The annual water rates are as follows :

Private houses, per family	$5 00
Each additional family	3 00
Private bath tubs, each	3 00
" water closets, each	3 00
" stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

Less than 500 gallons per day	12
One thousand to 1,500 gallons per day	10
Over 3,000 gallons per day	6

Napoleon—Population 2,543. The public water supply was put in by the village in 1895. A light plant was put in at the same time and the combined cost was $59,859, to which has been added $5,825 for the water and $3,581 for the light plant.

The supply is from the Maumee river just opposite the south end of town and in the back water of the Grand Rapids dam. The water is in danger of contamination from the sewer emptying just below the intake, and of course it gets full benefit of the sewage of Defiance, 18 miles above.

The water is pumped to a standpipe by two vertical, compound, condensing Smith-Vaile pumps of 1,000,000 gallons capacity each. The standpipe is 125 feet high and 20 feet in diameter, with a capacity of 290,000 gallons.

The average daily consumption is 192,700 gallons, allowing 5 per cent. slip, and the average daily consumption for each consumer is 96 gallons.

The mains give 70 per cent. of the population access to the water. There are 336 connections and 38 of these metered.

The public water is not drunk to any great extent, well water being largely used.

The annual water rates are as follows:

Private houses, five persons or less	$4 00
Each additional person	25
Private water closets, each	2 50
" bath tubs, each	3 00
" stables, one horse and carriage	2 00

Meter rates per 1,000 gallons:

Under 1,000 gallons per day	15
Two thousand to 3,000 gallons per day	10

Toledo—Population 126,000. The water works was put in by the city in 1872, the water being taken direct from the Maumee river as at present. The plant was appraised at $1,416,628.90 in 1894, and $300,000 have been spent on it since, making the present value of the plant $1,716,628, but it is estimated that the plant has cost to date $2,500,000.

The water is led to the pump well by a 5-foot steel conduit and pumped from there to the standpipe by four Worthington and one Knowles pump. Two of the Worthington pumps were put in in 1873, and have a capacity of 5,000,000 gallons each; these are horizontal, compound, duplex pumps. The Knowles is a horizontal, compound, duplex pump of 5,000,000 gallons capacity, and was erected in 1886. One large Worthington was put in in 1893 and its mate in 1898. These are vertical compound, duplex, high duty pumps of 15,000,000 gallons capacity each. This gives a combined capacity of 45,000,000 gallons per 24 hours.

The standpipe is 225 feet high and five feet in diameter, with a capacity of 42,000 gallons. It is used to regulate the pressure only.

There are 152 miles of mains, giving 75 per cent. of the population access to the water. There are 10,200 services in use, of which 4,000 are metered.

The average daily consumption is 7,677,000 gallons, and the average for each consumer is 125 gallons.

The annual water rates are as follows:

Private houses, one faucet	$5 00
Each additional faucet	1 50
Private bath tubs, each	3 00
" water closets, each	3 00
" stable, one horse and carriage	3 00

Meter rates per 1,000 gallons:

Less than 2,000 gallons per day	10
Thirty-five thousand to 55,000 gallons per day	06
Over 170,000 gallons per day	35

The water works intake is located above all Toledo sewer outlets, but it is claimed that the wind raises the water level in the river two feet, and this would be very apt to carry some of the sewage up over the intake. The only serious contamination below Napoleon is the children's home, five miles above the intake, as mentioned in the first part of the report.

Many houses have small filters through which all water for domestic use is passed, and there are quite a number who still use well water. The private wells are nearly all shallow dug ones, from 10 to 20 feet deep, there being but few drove wells in use.

Sewage—The sewage of Toledo bears no relation to water supplies unless it contaminates its own water, but a brief description will be given here:

There are 150 miles of sewer in, with 12 main outlets to the west side of the Maumee, three to the east side, seven to Swan creek and three outlets to the Ottawa river, which empty direct to the bay. There are any number of small outlets and some of these are to the Miami and Erie canal. It is estimated that 75 per cent. of the population have access to the sewers and that there are 8,400 connections to same.

Besides the sewage, the rivers and creeks get a large amount of manufacturing waste and refuse, which is dumped directly into them. During the warm weather the mud flats in the river give off pretty foul odors from the decaying refuse deposited on them.

Regulations have just been put in force regarding the construction of vaults, and the city is full of old pits and plank vaults that are loading the soil and ground water with filth.

Surface and Ground Water Supply.

Lima—Population 31,000. The public water supply was first put in in 1885–7 by the city at a cost of $338,000. Many extensions and additions have since been made and the cost to date is much more than the above figure. The original supply was from an impounding reservoir on Lost creek, which enters the Ottawa river just east of Lima. A dam 10 feet high and 30 feet long has been built across the creek forming a reservoir of six acres in area, and with a capacity of some 10,000,000 gallons. This reservoir is shallow, overgrown with weeds and dirty, and is dry all summer, except for a few stagnant pools. During the winter and spring rains the reservoir fills up and the water is run to a receiving well from which it flows by gravity to the storage reservoirs There are two storage reservoirs side by side which have a combined capacity of 120,000,000 gallons. These reservoirs had to be filled formerly during freshets or hard rains and then to supply the city until another rain came, and if the water was low the first part of the rain had to be caught. This first water was merely the washings from the watershed and was pretty foul, especially as there are a large number of oil wells within the drainage area and all their waste oil is washed into the reservoir by the first downpour,

The storage reservoirs have an area of 21 acres which gives them a depth of 17 feet. The sides and bottoms are the natural clay with no paving or riprap. These reservoirs have been cleaned only once, but there has been no trouble except for one year when a green growth appeared.

There was soon a great deal of complaint about the water and in 1894 eight wells were put down at the head of the impounding reservoir. These wells are from 150 to 200 feet deep and eight inches in diameter. A four-inch suction leads to a 1,000,000-gallon pump operated by a motor supplied with electricity from the central pumping station. The water is lowered from near the surface to 22 feet below it by a short period o pumping, as the wells are too close together. This water is pumped to the receiving well and flows to the storage reservoirs by gravity.

In 1897 one more well was put down on Lost creek near the P., F. W., and C. railroad, and an old oil well was also utilized. These wells are 10 inches in diameter and have a six-inch suction leading to a 1,000,000-gallon pump operated by an electric motor. This water is also sent to the receiving well and then to the reservoirs. It is estimated that the wells supply 1,250,000 gallons per day. The water is pumped from the storage reservoirs direct to the mains by two horizontal, compound, duplex Holly pumps of 3,000,000 gallons capacity each.

The average daily consumption is 1,900,000 gallons and the average for each consumer is 120 gallons.

There are 35 miles of mains giving some 80 per cent. of the population access to the water. There are 2,589 connections in use, of which 50 are metered.

Annual water rates are as follows:

Private houses, five rooms or less	$5 00
Each additional room to eight	1 00
Private bath tubs, each	3 50
" water closets, each	2 50

The meter rate is $15 per year as the minimum charge for which 75,000 gallons of water may be used and a charge of eight cents per 1,000 is made for all above that amount.

Ground Water Supplies.

Bluffton—Population 1,400. The water supply was put in by the city in 1896 at a cost of $17,000, which is nearly all the cost to date.

The supply is from eight wells eight inches in diameter and from 35 to 50 feet in depth. Only six of these wells are connected to the pumps. The limestone lies within a few feet of the surface and the wells get their water in this rock. The water rises to within five feet of the surface and can be lowered by the pumps to the suction limit, about 28 feet. The water is pumped to an elevated tank by a horizontal, simple, duplex Stillwell-Bierce-Smith-Vaile pump of 750,000 gallons capacity.

The tank is 20 feet in diameter and 30 feet high, with a capacity of 70,000 gallons, and it is placed on a steel frame tower 82 feet in height, this gives an average pressure of 35 pounds on the street level.

The wells have always supplied plenty of water but for use in cases of emergency an eight-inch intake pipe has been run to an old stone quarry, near the water works. This quarry contains about three and one-half acres and the water is from three to 20 feet deep; the upper five feet, or about 4,000,000 gallons, can be drawn off by the pumps. This emergency intake has not been used within the knowledge of the present engineer or for a year at least.

There are three miles of mains in giving about 90 per cent. of the population access to the water. There are 157 services in, of which 155 are in use and only one metered.

The average daily consumption is about 50,000 gallons, the estimate of the engineer only. The average daily consumption per consumer is only 55 gallons. This is low, especially as two railroads use the water.

The annual water rates are as follows:

Private houses	$5 00
" bath tubs, each	2 00
" water closets, each	5 00
" stables, one horse and carriage	1 50

Meter rates per 1,000 gallons:

Five hundred to 1,000 gallons per day	10
Three thousand to 4,000 gallons per day	6

Bryan—Population 3,176. The public water supply was put in by the village in 1893-4, and has cost to date $45,000.

The supply is from 13 wells, eight of which were put down in 1893, and for fear that these might not supply enough water five more were put down later. These wells are from 95 to 112 feet in depth, 4½ inches in diameter, and go through hard-pan, cement-gravel, quicksand and into gravel where the water is found. When not being pumped all the wells flow and plenty of water has always been supplied, the water level never going below the suction of the pumps. The wells flow to a common main to which the suction of the pump is attached. The water is pumped direct by two horizontal, compound, duplex Hughes pumps of 1,000,000 gallons capacity each.

There are 14 miles of mains in, which give 90 per cent. of the population access to the water. There are 348 services in, of which only about one-half are in use all the year round, the others used in summer only. None of the services are metered. The average daily consumption is 400,000 gallons and the average for each consumer is about 160 gallons. This is due to the large amount of water used for sprinkling in the summer.

The annual water rates are as follows:

Private houses, five persons or less	$4 00
Each additional person	25
Private bath tubs, each	2 00
" water closets, each	3 00
" stables, one horse and carriage	2 00

Continental—Population 1,500. The water works was put in by the village in 1894, and has cost to date about $7,000.

The supply is from a well 75 feet deep and eight inches in diameter. The well strikes the limestone 48 feet down and the water rises to within 13 feet of the surface. It is pumped to a standpipe by a deep well pump of 100,000 gallons capacity. The pump cylinder is 20 feet below the surface and the water can be lowered 45 feet if necessary, but it has never reached this limit, as the well has always supplied enough water. The standpipe is 10 feet in diameter and 100 feet high, with a capacity of 40,000 gallons. The deep well pump keeps the standpipe full for ordinary service. During a fire a 100,000-gallon simple, duplex Stillwell-Bierce pump draws from the standpipe and pumps direct into the mains.

There are 2¼ miles of mains, giving about 50 per cent. of the population access to the water. There are 75 services, of which 55 are in use and two of these metered. The average daily consumption is 45,000 gallons or an average of 125 gallons per consumer.

The annual water rates are as follows:

Private house	$6 00
" bath tubs, each	3 00
" water closets, each	3 00
" stable, one horse and carriage	4 00

The meter rate is 15 cents per 1,000 gallons.

Delphos—Population 4,100. The water works was put in by the village in 1896, and has cost to January 1, 1898, $79,452 81, which is practically the cost to date. The supply is from seven wells, eight inches in diameter and from 191 to 300 feet in depth. Six of the wells flow to a receiving well, and one of them is pumped to it by a Stillwell-Bierce air-lift. This one well furnishes nearly all the water; it flows naturally at the rate of 56,000 gallons per day, and is pumped at the rate of 185,000 gallons per day. The wells obtain their water from the Onondago limestone, which is 20 feet below the surface. The water rises to within eight feet of the surface, and during a test one well was lowered 20 feet by pumping at the rate of 85,000 gallons a day. The receiving well is 40 feet in diameter and 37½ feet deep, with a capacity of 235,000 gallons. It is excavated into the rock and the sides walled up with brick. Surface water is admitted by several tiles just above the rock, so as to relieve the pressure on the outside of the walls. The well is covered with a conical board roof.

Before the air-lift was put in the water was almost unusable from the large amount of sulphur present, but the aeration afforded by the air-lift seems to have overcome the objection, and the water is free from the taste and smell of sulphur. A strong odor of sulphur is noticed in the receiving well, and the water as it comes from the air-lift has a milky appearance.

The water is pumped from this well to a standpipe by two horizontal, compound, duplex, Laidlow-Dunn-Gordon pumps of 1,000,000 gallons capacity each. The standpipe is 20 feet in diameter and 130 feet high, with a capacity of 305,000 gallons, and gives an average pressure of 55 pounds.

There are 15.38 miles of mains, giving 90 per cent. of the population access to the water. There are 324 services, of which 244 are in use and four metered. The average daily consumption is 85,000 gallons per day, and the average per consumer is 60 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$3 00
Each additional room	25
Private bath tubs, each	2 00
" water closets, each	2 00
" stables, one horse and carriage	2 00

Meter rates per 1,000 gallons:

Less than 1,000 gallons per day	25
More than 5,000 " " "	10

Hicksville—Population 3,569. The water works was put in by the village in 1890, and has cost to date about $22,000. The supply is from seven wells, four of which are 32 feet in depth and six inches in diameter, two are 132 feet deep and six inches in diameter and one is 132 feet deep and three inches in diameter. The deep wells go through about 120 feet of clay, sand and hard-pan, and find their water in sand and gravel above the Ohio black shale. All the wells flow with a head of about four feet when not being pumped, but do not supply enough water in the dry spells.

The wells are pumped by direct suction, only six of them being attached; one flows to a small reservoir 100 feet square and holding 387,000 gallons, which is kept on hand for an emergency. This reservoir is used for fire purposes only, but causes a good deal of complaint, as the consumers fear that it is being used at other times. The water is pumped direct to the mains by two horizontal, simple, duplex, non-condensing Hughes pumps of 750,000 gallons capacity each.

There are 4½ miles of mains, which give some 80 per cent. of the population access to the water. There are 237 services and 217 in use, with none metered. The average daily consumption is 150,000 gallons and the average for each consumer is 115 gallons.

The annual water rates are as follows:

Private houses, five persons or less	$4 00
Five to 10 persons	5 00
Private bath tubs, each	2 00
" water closets, each	2 50
" stable, one horse and carriage	2 00

Montpelier—Population 2,000. The water works was put in by the village in December, 1895, and has cost to date about $26,000. The supply is from three drilled wells, 113 feet deep and eight inches in diameter; only two of the wells are in use now. The wells go through clay, fine sand and into gravel where the water is found. The water rises to within 28 feet of the surface, and as the wells are pumped by direct suction the pumps have been placed in a well 20 feet deep, and they can lower the water the suction limit or about 45 feet from the surface. The suction from the pumps is six inches in diameter, and goes down 36 feet into the casing.

The water is pumped to a standpipe by two horizontal, compound, duplex, non-condensing Worthington pumps of 750,000 gallons capacity. The standpipe is 12 feet in diameter and 110 feet high with a capacity of 93,000 gallons, and gives an average pressure of 38 pounds. There are four and one-half miles of mains giving some 90 per cent. of the population access to the mains. There are 209 services in and 206 in use, of which only one is metered. The average daily consumption is 130,000 gallons and the average for each consumer is 105 gallons.

The annual water rates are as follows:

Private family	$2 00
" water closets, each	2 50
" bath tubs, each	1 50
" stable	1 00
Lawn sprinkling	3 00

The meter rate for the one consumer is five cents per 1,000 gallons.

St. Mary's—Population 3,500. The water works was put in by the village in 1895 and has cost to date about $57,500. The supply is from four drilled wells from 262 to 272 feet in depth and eight inches in diameter. The wells strike the limestone at 125 feet and get a very hard water from this rock, which also contains some sulphur and iron.

The wells flow to a covered receiving well 38 feet in diameter and 28 feet deep, giving a capacity of 237,000 gallons. During the test one well was lowered 13 feet and could be sent no farther with the means at hand.

The water is pumped from the receiving well direct to the mains by two horizontal, compound, duplex, condensing Smith–Vaile pumps of 750,000 gallons capacity each.

The ordinary pressure carried is 50 pounds. There are 12½ miles of mains which give 75 per cent. of the population access to the water. There are 280 services, of which 275 are in use with seven of these metered.

The average daily consumption is about 100,000 gallons and the average per consumer is 60 gallons.

The annual water rates are as follows:

Private houses, per family	$4 00
" water closets, each	2 00
" bath tubs, each	2 00
" stable, one horse and carriage	1 00

The meter rate per 1,000 gallons is 10 cents, with a minimum charge of $10 per year.

Van Wert—Population 7,000. The water works was put in by the town in 1891 and has cost to date $130,000. The supply is from nine wells six inches in diameter and 200 feet deep. The water in found in limestone which commences 40 feet below the surface. The water rises to within from 12 to 18 feet of the surface and is pumped down about 40 feet. The pumps are set in a well 20 feet deep. The water is pumped direct from the wells to the mains by two horizontal, compound, duplex, condensing pumps of 1,500,000 gallons capacity each. The pumps are of the Gordon pattern but were put in by the Holly Company. A reservoir, 165 feet square, 18 feet deep and holding 3,000,000 gallons is used to store the water for an emergency. The reservoir is near the pumping station and is kept full of well water all the time and is only drawn on by the pumps in case of fire, when the wells could not supply the sudden increase in the demand.

There are 19 miles of mains, which give about 70 per cent. of the population access to the water. There are 830 services, of which 550 are in use and seven of these metered. The average daily comsumption is 225,000 gallons and the average per consumer is 70 gallons.

The annual water rates are as follows:

Private house, five persons or less	$5 00
Each additional person	25
Private bath tubs, each	3 00
" water closets, each	3 00
" stables, one horse and carriage	2 50

Meter rates per 1,000 gallons:

Five hundred gallons per day or less	25
One thousand to 3,000 gallons per day	15
Over 25,000 gallons per day	7

Wapakoneta—Population 4,000. The water works was put in by the village in November, 1895, and has cost to date $58,000. The supply is from nine drilled wells, eight of which are 35 feet deep and six inches in diameter and one is 142 feet deep and six inches in diameter. The eight shallow wells are in two sets of four each, with each set connected to a common main running between the sets. Only one of these shallow wells is in use. This well, together with the deep well, flows to a receiving well. Most of the water that formerly was collected by the shallow wells now enters the receiving well directly through tiles placed in the floor of same. The receiving well is built of brick, covered with a conical roof, and is 30 feet deep, 20 feet in diameter and has a capacity of 70,000 gallons. Both the shallow well and the receiving well get their water from a bed of gravel at the river level. The deep well just enters the limestone, which lies 135 feet below the surface. The water is pumped from the receiving well direct to the mains in summer and to a standpipe in the winter. The standpipe is 125 feet high and 25 feet in diameter, with a capacity of 459,000 gallons. The pumps are horizontal, compound, duplex, made by the John A. McGowan Company, and have a capacity of 1,000,000 gallons each.

There are 11¾ miles of mains, giving some 80 per cent. of the population access to the water. There are 280 services, of which 276 are in use and only one metered. The average daily consumption is 126,000 gallons, and the average per consumer is 75 gallons.

The annual water rates are as follows:

Private house, each family	$5 00
" bath tubs, each	2 00
" water closets, each	2 00
" stables, one horse and carriage	1 00

Meter rate per 1,000 gallons is 10 cents, with $10 for the minimum charge for a small meter per year.

Wauseon—Population 2,210. The water works was put in by the village in 1897, first operated April, 1898, and has cost to date $25,000. The supply is from two wells, each 185 feet deep and eight inches in diameter; only one of the wells is in use now. The wells go through shale, fine gravel and into coarse gravel, where the water is found. The water comes to within 30 feet of the surface, and is pumped to a receiving well by a Downey deep well pump of 400,000 gallons capacity. The water can be lowered 75 feet by this pump, but it has never reached this limit yet. During ordinary pumping, the well not in use and 150 feet away, is six feet. The receiving well is built of brick and is covered with a conical tin roof; it is 19 feet deep and 30 feet in diameter, with a capacity of 100,000 gallons. The water is pumped from this reservoir to a standpipe by a horizontal, compound, duplex, Smith-Vaile pump of 750,000 gallons capacity. The standpipe is 12 feet in diameter and 120 feet high, and has a capacity of 100,000 gallons.

The water works is situated one mile south of the town.

There are 7½ miles of mains, giving 90 per cent. of the population access to the water. There are 125 services in use, of which 20 are metered. The average daily consumption is 45,000 gallons or an average of 60 gallons per consumer.

The yearly water rates are as follows:

Private houses, five persons or less	$4 00
Each additional person	25
Private bath tubs, each	2 00
" water closets, each	3 00
" stables, one horse and carriage	2 00

Meter rates per 1,000 gallons:

Less than 100 gallons per day	30
Five hundred to 1,000 gallons per day	20

SUMMARY.

Of the 221,757 people in the 15 towns having public water supplies, 118,000 of these use the "hydrant" water or at least have it on their premises where it can be used. The water mains are, however, so extensive that some 170,800 of the people could get the water if they so desired. Where the deep well waters are furnished nearly all those that have the water use it for domestic purposes, while the surface water supplied to the five towns is so poor and unpalatable, especially in summer, that the people are compelled to use private well water for domestic purposes. The general public cares little how polluted a water may be as long as it is clear and cool with no unpleasant taste or odor, and so when the surface waters get warm and foul smelling in the summer, or muddy during heavy rains, they turn to the cool and clear well water, which may contain double the amount of pollution that the surface water has and not show it at all.

The following table contains the summary in detail of both the water supplies and the sewage of these same towns:

MAUMEE WATERSHED.

	Water supply.												
	Estimated population 1899.	Sourc. of supply.	Method of supply water.	Ownership of water works.	Date of installation of water works.	Cost of plant.	Miles of mains.	Per cent. of population having access to mains.	Number of services in use.	Number of meters.	Average daily consumption in gallons.	Average daily consumption for each consumer.	Total pumping capacity.
Defiance	9.759	Maumee river	Pumping to standpipe	Private	1888	$400,000	18	65	450	27	900,000	300	4,000,000
Findlay	20 000	Blanchard river	Pumping direct	City	1889	833,000	27	60	1,036	114	900,000	140	5,000,000
Napoleon	2,543	Maumee river	Pumping to standpipe	Village	1895	35,000	....	70	336	38	192,700	96	2,000,000
Teledo	126,000	"	"	City	1872	2.500,000	152	75	10,200	4,000	7,677,000	125	45,000,000
Lima	31,000	Creek and 10 wells	Pumping direct	"	1885	338,000	35	80	2,589	50	1,900,000	120	6,000,000
Bluffton	1,400	8 wells	Pumping to tank	Vill	1896	17,000	3	90	155	1	50,000	55	750,000
Bryan	3,176	13 "	Pumping direct	"	1893	45 000	14	90	260	....	400,000	150	2,000,000
Continental	1 500	1 "	Pumping to standpipe	"	1894	7,000	2¼	50	55	2	45,000	125	100 000
Delphos	4,100	7 "	"	"	1896	80,000	15⅓	90	244	4	85,000	60	2,000,000
Hicksville	3,569	7 "	Pumping direct	"	189[illegible]	22,000	4⅓	80	217	....	150,000	115	1,500,000
Montpelier	2,000	3 "	Pumping to standpipe	"	1895	26,000	4½	90	206	1	130,000	105	1,500,000
St. Marys	3 500	4 "	Pumping direct	"	1895	57 000	12½	75	275	7	100,000	60	1,500,000
Van Wert	7,000	9 "	"	"	1891	130,000	19	70	550	7	225,000	70	3,000,000
Wapakoneta	4 000	9 "	Pumping to standpipe	"	1895	58,000	11¾	80	276	1	126,000	75	2,000,000
Wauseon	2,210	2 "	"	"	1897	25,000	7½	90	125	20	45,000	60	750,000
Totals	221,757	4 rivers. 1 creek and wells. 10 wells.	6 direct. 1 tank. 8 standpipes.	1 private. 14 public.	....	$4,073,000	326.3	....	16,974	4,272	12,925,700	....	77,100,000
Averages	14,781				1891	271,533	23.3	77	1,132	285	861,710	104	5,140,000

MAUMEE WATERSHED—Concluded.

	Sewage.							
	Outlet of sewers and storm drains.	Number of outlets.	Is sewage a nuisance?	Does sewage pollute the water supply of same city or village?	Miles of sewers.	Per cent. of population having access to sewers.	Number of closet and vault connections.	Population using sewers.
Defiance	Maumee river and Auglaize river	12, 6,	No.	No.	11.9	60	250	1,500
Findlay	Blanchard river and Eagle creek	5, 4,	Yes.	No.	12.2	50	500	3,000
Napoleon	Maumee river and canal	2, 1,	No.	Yes.	2.8	30	50	300
Toledo	Maumee river, Ottawa river and Swan creek	15, 3, 7,	Yes.	Yes.	150	75	8,400	60,000
Lima	Hog creek, ditches to above	18, 10,	Yes.	No.	25	75	2,500	15,000
Bluffton	Big Relley creek	....	Yes.	No.	....	....	*10	75
Bryan	Ditches to Beaver creek	....	No.	No.	....	Small.	†15	100
Continental	Powell creek and Blanchard river	....	No.	No.	....	Very small.	†7	50
Delphos	Jenning's creek and Flat Rock creek	5, 3,	Yes.	No.	....	“	10	75
Hicksville	Mill creek	....	No.	No.	....	....	†1	6
Montpelier	St. Joseph river	....	No.	No.	....	Very small.	†9	60
St. Mary's	St. Marys river	....	Yes.	No.	....	....	*10	70
Van Wert	Town creek	13	Yes.	No.	4.2	20	60	400
Wapakoneta	Auglaize river	....	Yes.	No.	....	10	40	250
Wauseon	Ditches to Turkey Foot creek	7	Yes.	No.	5.2	60	65	450
Totals	....	....	9 Yes.	2 Yes.	....	....	11,927	81,336
Averages	....	....	9 No.	13 No.	....	26	795	5,422

* Private sewers. † Connected to storm drains.

APPENDIX II.

First Report

UPON THE

CONDITION OF THE

Public Water Supplies of Ohio.

BY THE OHIO STATE BOARD OF HEALTH.

1899.

REPORT UPON THE CONDITION OF PUBLIC WATER SUPPLIES OF OHIO.

Under the provisions of the act of 1898, the State Board of Health is required to report annually upon the condition of public water supplies.

The scope such an inquiry may take is only limited by the amount of money which can be devoted to it. As the act referred to carried no special appropriation, the Board deemed it advisable for this year to offer a preliminary report upon the present condition of public water works, and, to some extent, their sources of supply. The inquiry has been further limited by considering only supplies taken in whole or in part from surface waters. This selection was made, as the surface supplies are most liable to pollution, and are also of more importance as regards the number of persons using such water. Besides, the special preliminary report upon sources of water supplies, published last year as a special report, contains an excellent account of the deep well supplies prepared by Prof. Orton, State Geologist.

The wisdom of providing for a study of and annual report upon the condition of our public water supplies will not be questioned. Nothing more nearly touches the public health than the purity of the water supply; and the condition of the public supplies can only be known by a systematic, continued study of the various sources from which they are derived. We feel confident that the value of this work will be seen, and that means will be provided for a more thorough and comprehensive study of the subject hereafter.

It is noted elsewhere in our annual report for this year that the Board is engaged in a study of all important streams in the State, and this report upon the condition of water works with surface water supplies should be read in connection with the reports upon stream conditions.

The report here given concerns 58 cities and villages using surface water in whole or in part, and with a combined estimated population of 1,459,919.

Each of these cities was visited by the engineer, who obtained his information at first hand, when possible, and when not, from the local engineer, superintendent of water works, health officer or other person best informed upon the subject. It is astonishing to find the little attention given in many places to keeping records of public works, and it has often been impossible to obtain desired information.

Special attention was given to sources of pollution within 10 miles of the intake of any water works. This distance was taken because of the provisions of Section 2433, which is as follows:

"The jurisdiction of any corporation owning water works, to prevent or punish any pollution of the water, shall extend 10 miles beyond the corporation limits." (66 v., 209.)

It should by no means be inferred that this Board gives support to the idea set forth in this statute that water sufficiently purifies itself in flowing a distance of 10 miles. It was simply desired to point out obvious sources of pollution within that distance, which under present laws water works companies have power to prevent.

Following is the report of Mr. Flynn, the engineer engaged for this work:

SURFACE WATER SUPPLIES.

BY B. H. FLYNN, C. E.,

ENGINEER OHIO STATE BOARD OF HEALTH.

Introduction.

1. Surface Water:
   - A. Ohio River.
   - B. Interior Streams.
   - C. Lake Erie.
   - D. Wells and Galleries Supplied by Surface Water.
2. Subsurface Water:
   - Galleries and Wells Supplied by Subsurface Water.
3. Surface and Ground Water.
4. Subsurface and Deep-Seated Water.

INTRODUCTION.

There are 71 cities and villages in the State that have water works supplied either wholly or in part with water from surface and subsurface sources. Of the 39 which are supplies directly by surface water six receive surface water through galleries or wells, 10 are supplied by subsurface water and 16 have combined supplied of surface and ground water.

Owing to lack of information as to the source of the public water supplies, and the inability of the engineer to visit every town in the State, it will, probably, be found that there are a few subsurface supplies not included in the above number.

The term subsurface is applied to those waters which lie just beneath the ground level. The water may lie in sand and gravel from an old river bed, in loose rock, or in the ordinary soil, and is in reality a ground water, but it has but recently left the surface on which it fell as rain and contains nearly as much of the impurities due to surface pollution as the water which ran-off in the streams instead of soaking into the ground. On some occasions this subsurface water might contain more of the surface pollution than the run-off water. Light rains would leach out the impurities, soak into the ground, and give no run-off; heavier rains would first soak into the ground until that first became saturated and more impervious, then the water would run-off in the surface streams carrying any objectionable water left.

Sewers discharging into flowing streams would not affect this subsurface water to any appreciable extent, but those sewers discharging into small ditches, which are dry in summer and give the sewage a chance to soak into the ground, would seriously pollute this subsurface water.

Leaky vaults. surface privies, night-soil burying grounds and garbage dumps are probably the chief source of pollution of this water.

In course of time this subsurface water percolates through crevices and porous material and becomes the deep-seated water. It has undergone a process of filtration and purification and may contain but little of the organic pollution in the original water. There is no sharp line between subsurface and deep-seated water, but it is intended to keep in the former class all those waters the purity of which is plainly influenced by surface pollution.

The supplies have been divided into the following classes: Surface water, subsurface water, and combined supplies, that is, supplied in part by surface water and the rest by ground water.

The surface water supplies have been divided into four subdivisions depending upon whether the source was (1) the Ohio river, (2) interior streams, (3) Lake Erie, or (4) wells and galleries supplied by surface water.

The combined supplies are divided into two classes (1) surface and ground water, and (2) subsurface and deep-seated waters.

The following table shows the subdivisions, number of towns in each and the aggregate population of the towns in each class:

Source.	Number of towns.	Total population.
1. Surface water—		
(*a*) Ohio river	11	487,738
(*b*) Interior streams	21	346,734
(*c*) Lake Erie	6	411,127
(*d*) Wells and galleries supplied by surface water	7	18,760
Total	45	1,264,359
2. Subsurface water—		
Wells and galleries supplied by subsurface water	10	95,929
3. Combined supplies—		
(*a*) Surface and ground water	14	341,875
(*b*) Subsurface and deep-seated water	2	7,892
Total	16	349 767
Grand total	71	1,710,055

There are 82 cities and villages with a total population of 404,993, which are supplied with ground water. These are mostly small towns with populations varying from 250 to 2,000 or 3,000. There is one city with a population of about 90,000, two with populations between 20,000 and 30,000, three between 10,000 and 20,000 and 12 between 5,000 and 10,000 and 64 with populations below 5,000.

It is thus seen that the surface water supplies are of greater importance than the ground supplies, more than four times as many people being dependent upon the former as upon the latter. This ratio would be increased if all subsurface supplies were considered. It does not matter much how these supplies are classified as long as it is borne in mind that nearly 2,000,000 people are dependent for water upon supplies that are liable to be polluted by the neglect and carelessness of their neighbors or themselves.

There are 153 towns with a total population of 2,115,048 that have a public water supply of some kind. Thirteen of these towns, with a total population of 6,353, are not classed as urban as their individual populations are below 1,000.

One hundred and ten towns, with a total population of about 200,000, have no public water supplies. This number includes only one town, Jackson, of more than 5,000 people, seven with populations between 3,000 and 5,000, 19 with populations between 2,000 and 3,000, and 85 with populations below 2,000 and above 1,000.

The total urban population of Ohio, as estimated for 1899, is 2,308,695. This includes all towns of 1,000 or more inhabitants.

Thus over 91 per cent. of the total urban population has a public water supply of some kind or other. That is, the above percentage live in towns that have water supplies, though all of each town's population cannot obtain the public water as the mains do not cover all the territory within the corporate limits, and all the people accessible to the mains do not use the water from them. It is a very difficult matter to bring about the abandonment of a well which has been in use for many years seemingly with no ill effects.

Following are the towns examined, grouped with reference to the source of supply:

1. Surface water.

(*a*) Ohio river. Cincinnati, Bellaire, Bridgeport, East Liverpool, Ironton, Martin's Ferry, Marietta, Portsmouth, Steubenville, Toronto and Wellsville.

(*b*) Interior streams. Alliance, Bucyrus, Cambridge, Defiance, Dennison, Elyria, Findlay, Fostoria, Lisbon, Monroeville, Napoleon, Norwalk, Oberlin, Piqua, Toledo, Uhrichsville, Upper Sandusky, Warren, Wellston, Youngstown and Zanesville.

(*c*) Lake Erie. Ashtabula, Cleveland, Conneaut, Lorain, Port Clinton and Sandusky.

(*d*) Wells and galleries supplied by surface water. Fairport, Gallipolis, Greenfield, Painesville, Richmond, Ripley and Willoughby.

2. Subsurface water.

Wells and galleries supplies by subsurface water. Ashland, Attica, Circleville, Greenville, Hillsboro, Kenton, Lancaster, Nelsonville, Springfield and Wadsworth.

3. Combined supplies.

(*a*) Surface and ground water. Akron, Bellevue, Canton, Columbus, Crestline, Fremont, Harrison, Lima, Marion, Massillon, Niles, Ravenna, Tiffin and Wooster.

(*b*) Subsurface and deep-seated water. Eaton and Wapakoneta.

The cities taking water direct from the Ohio river have unquestionably a poor supply. The river is subject to such frequent changes in level that the water is muddy for the greater part of the time, and it is always polluted with sewage. It is impossible for the large cities on the Ohio river to discharge all their sewage into it without dangerously polluting the same. The large volume of the stream is the only thing that prevents it from becoming an actual nuisance.

The solution of the water question for these river towns is a difficult matter. The protection of the stream from pollution is a problem to be solved only by national authority, as the stream and its branches pass through and by so many states. The small towns may obtain a usable water by means of wells and galleries in the bed of the stream, but this method has not as yet been made practical for large cities. Gallipolis and Ripley obtain river water in this manner.

Three large cities are trying to solve the question by filtration, which seems to be the only thing left.

If raw sewage is allowed to go directly into the river, it must sooner or later be abandoned as a source of water supply, or the water must first be carefully purified.

The problem of a pure water supply for the cities using the interior streams should be of much easier solution, but unfortunately it is not.

The State Board of Health controls the introduction of new sewer systems, but cannot as yet condemn those already in. Thus there are a large number of towns using water from rivers which receive the sewage of all the towns above them, some of which are but a few miles distant. The report on the Sandusky watershed shows an example of this which would be hard to equal. That which permits this gross violation of sanitary law is the popular fallacy of the self-purification of streams in a few miles of flow. It is unfortunate that all visible pollution does disappear after a short flow, and this is the only criterion to the popular mind. As the work of chemically and bacteriologically examining river water continues the danger of using a sewage polluted water will become better recognized, and the measures for prevention of pollution more easily enforced.

As a class the supplies from the interior streams are bad, nearly all of them suffering more or less from sewage pollution.

Alliance, Fostoria, Norwalk, Oberlin and Wellston impound the waters of small streams, which are comparatively free from sewage pollution. Cambridge, Dennison, Findlay, Uhrichsville and Monroeville use the water direct from streams having little sewage pollution. Piqua obtains its water supply from a branch of the Miami and Erie canal at a point where the sewage pollution is not evident. The remaining 10 cities use a water which is seriously polluted with raw sewage.

With cities taking water from Lake Erie the question of a pure supply lies with each town itself. The lake as a whole is free from serious pollution on account of the enormous dilution suffered by the sewage emptied into it. If this sewage is kept away from the intakes a pure supply of water can be had. Port Clinton, Ashtabula and Conneaut receive a water which, as yet, is not badly polluted, but if the sewer systems are extended and the sewage discharged directly into the lake at the present outlet the water will not long remain pure, and new intakes farther removed from the sewage will have to be built.

Painesville collects the lake water by means of galleries, and has a good supply. Sandusky gets a water from the Sandusky bay, which is subject to local sewage pollution. Lorain has a supply from the lake, opposite Black river, which carries a great deal of sewage; the city, however, filters the water before using it. Cleveland obtains the lake water from a crib 1¼ miles out, but even at this distance the water is not free from sewage. In order to obtain a pure supply the city has under construction an intake tunnel which will obtain the lake water four miles from shore, and in connection with this contemplates building a large intercepting sewer to carry all the sewage 10 miles down the lake.

The five supplies from wells and galleries supplied by surface water are good. Painesville, Fairport and Richmond have a common supply from galleries on the shore of Lake Erie. Ripley has wells on the banks of the Ohio river and obtains the river water, together with some ground water. Gallipolis has a system of wells, or rather filter boxes, in the bed of the Ohio. Greenfield and Willoughby have wells supplied by small streams.

The subsurface supplies are on the whole good. Circleville and Springfield obtain an excellent water from extensive gravel beds by means of galleries. Lancaster obtains a supply from the same source by means of a gallery, but the water is unquestionably seriously polluted by sewage being emptied onto the ground almost directly over the gallery. Ashland, Attica, Greenville, Hillsboro and Nelsonville obtain a similar water by means of wells. Wadsworth obtains a supply from springs and wells, which are influenced by the surface water. Kenton obtains its water from a hole excavated in the limestone rock. The supply is probably largely surface water which has percolated through crevices in the rock. The level varies with local conditions; therefore showing no remote origin of the water.

The surface and ground supplies are so varied that no general statement can be made, and the detailed reports following must be consulted. There are two reasons for the use of the two kinds of water which will apply in most cases. First, the original supply was from ground sources, and, the quantity not being sufficient, recourse had to be made to a surface water, usually with detriment to the quality of the water; or second, the original supply was from surface sources, and an attempt to improve the quality has introduced the ground water, but the latter not being sufficient in quantity has compelled the surface supply to be retained in part at least. This latter reason is by far the most common one with the supplies under consideration.

In the present list there are only two towns given using a subsurface and deep-seated water. This class, together with the subsurface supplies, has not been thoroughly worked up, and the results are given for what they are and not as representing a complete canvass of the State.

Following are reports on the different supplies examined, grouped according to the classification above. With the report on each water works there is annexed a short description of the private wells of the town, and also of the sewerage, together with a few remarks on the general sanitary condition:

All the facts pertaining to the pollution of the water supplies of Alliance, Columbus, Kenton, Niles, Warren and Youngstown have been taken from the report by Prof. C. N. Brown, contained in the special report of the Ohio State Board of Health for 1898.

1. SUBSURFACE SUPPLIES

(*a*) OHIO RIVER.

Cincinnati, Hamilton county, population 375,000. This city is the metropolis of Ohio. The actual population of the community is much larger than the above figure as there are a great many suburb towns supported entirely by Cincinnati. Across the river, in Kentucky, are the cities of Covington, Newport, Dayton and Bellevue, many of the people of which are employed in Cincinnati.

Cincinnati besides its large amount of general manufacturing is a shipping and commercial center of growing importance.

Water supply—Owing to the improvements in the water supply of Cincinnati, which are now under way, only the briefest review of the present plant will be given.

The first public water works was put in in 1820 by a private company operating under a 99-year franchise granted in 1817. The plant changed hands several times and a number of attempts were made to sell it to the city during the next 15 years. Finally, in 1839, for the sum of $300,000 the city obtained possession of the plant, consisting of a pump house, two pumping engines, reservoir, 19 miles of wooden pipe, three and one-half miles of iron pipe, land, etc.

The water works has steadily grown from that time until it now consists of six stations, supplying seven different services. Four of the stations and five of the services are supplied with water from the Ohio river through the main station on Front street. The Linwood station supplies two services from driven wells. The Front street station pumps the river water to the Third street reservoir and to Eden Park reservoir. The Third street reservoir supplies the low land along the river front and the Eden Park reservoir supplies the business portion of the city and the strip up the Mill Creek valley. The Eden Park reservoir water is repumped by the Eden Park station and by the Hunt street station to tanks on Mt. Auburn and to a tank in Eden Park. Part of the water of the Third street reservoir is pumped by the Price Hill station to the Western Hills service which supplies two suburban districts. Part is also pumped by the Cumminsville station to supply a small district in the northwestern part of the city. The Third street reservoir was completed about 1850 and has a capacity of 5,000,000 gallons. The Eden Park reservoir was completed in 1878 and has a capacity of 10,000,000 gallons.

The following table shows the tanks in use:

Name.	Number.	Diameter in feet.	Height in feet.	Total capacity in gallons.
Linwood	1	20	25	54,051
Mt. Auburn	2	40	70	1,128,034
Eden Park	1	30	20	95,178
Price Hill	4	30	50	1,036,388

The total pumping capacity in the Front street station through which all the city water, except that from the Linwood wells must pass is 99,236,160 gallons, divided among 16 pumps of every conceivable make, age and condition. The Linwood station has a pumping capacity of 1,180,800 gallons, making a total primary pumping capacity of 100,416,960 gallons. The four secondary stations contain 10 pumps of 22,451,440 gallons capacity.

The following table gives the make, date of installation, capacity, service and station of all the pumps in use:

TABLE SHOWING MAKE, DATE OF INSTALLATION, CAPACITY, SERVICE AND STATION OF PUMPS IN USE BY CINCINNATI WATER WORKS.

Manufacturer.	Number in use.	Date of installation.	Capacity for 24 hours.	Service.	Station.
A. Harkness & Son	1	1851	6,782,400	Third street	Front street.
O. A. Powell & Sons	1	1854	6,782,400	"	"
The Miami Machine Works	2	1874-5	*7,413,120	Eden Park	"
Robert Wetherill & Co. (steam end) }		1885			"
Wilson-Snyder Manufacturing Co. (water end) }	2	1892	*7,884,000	Eden Park	"
Henry R. Worthington	2	1888	*11,127,600	"	"
The Gordon Steam Pump Co. }	1		2,937,600	"	"
Barr Pumping Eng. Co. }	3		*4,328,640	"	"
Knowles Steam Pump Co. } Auxiliaries	1	1892	1,382,400	"	"
Henry R. Worthington }	1		6,336,000	"	"
Gordon Steam Pump Co }	2		*4,590,000	"	"
The Laidlow-Dunn-Gordon Co	2	1893	*590,400	Linwood	Linwood.
Henry R. Worthington	1		4,567,680	Mt. Auburn	Hunt street.
The Niles Tool Works	1	1869	4,592,320	"	"
Wilson-Snyder Manufacturing Co	1	1893	2,898,720	"	Eden Park.
Holly Manufacturing Co	2	1894	*4,373,920	"	"
Wilson-Snyder Manufacturing Co	2	1893	*541,440	Western Hills	Price Hill.
" " " "	1	1893	372,960	Cumminsville	Cumminsville.
Knowles Steam Pump Co	1	1893	159,840	"	"
The Cook Well Co	1	1893	28,800	"	"

* Capacity of each pump.

The auxiliaries in the above table were introduced about 1892, owing to the broken down condition of the pumps in Front Street Station. The pumps were of the horizontal type and were placed on a boat and on a movable incline, so that the level of the pump could vary with the height of the river, and the water always be kept within the suction distance of the pump.

The following table shows that amount of water pumped by each primary station and the amount repumped by the secondary stations in 1897:

Station.	Amount in gallons.	Per cent. of whole.
Front Street (low service)	2,847,022.474	17.58
Front Street (middle service)	13,334,141,713	82.35
Linwood	11,228,400	.07
Total for primary stations	16,192,392,587	100.00
Hunt Street (Mt. Auburn)	652,938,330	4.02
Eden Park	2,137,178,606	13.20
Price Hill	152,115,359	.94
Cumminsville	95,550,205	.59
Total for secondary stations	3,037,782,600	18.75

The Linwood station was originally owned by the village of Linwood, but when the latter was incorporated with Cincinnati, the water works became part of the latter system. The supply is from two 6-inch wells and two 8-inch wells, each about 100 feet deep. The wells go through sand and gravel to bed rock, the water being found in the gravel.

There are 371.81 miles of mains in, giving nearly all Cincinnati access to the water and also a little outside territory. There are 45,674 services in, of which 2,369 are metered and 618 are for elevators.

The average daily consumption is 43,933,708 gallons, the average per consumer is 145 gallons, and the average per capita is 118 gallons, suggesting that there is still some well water used

The annual water rates are as follows:

Private houses, one family,	one or two rooms	$3 00
" " "	three or four rooms	4 20
" " "	five or six rooms	5 20
" " "	eleven or twelve rooms	8 50
" " "	fifteen or sixteen rooms	10 30

Private houses, each additional family	$2 00
" bath tubs, each	2 70
" water closets, self-closing, each	1 50
" stables, one horse and carriage	1 80

Meter rates per 1,000 gallons:

60,000 gallons or less per month	87
637,500 gallons or over per month	87

Owing to the serious pollution of the present water supply and to the inadequacy of the present pumping station, a commission was appointed to recommend a new supply to the city. As a result of the report of the commission the Ohio river is to continue to be the source of the supply, but the water is to be taken opposite California, above Cincinnati, near the Kentucky side, in the channel of the river. The water is to be first passed to large settling basins, then filtered and pumped through the new pumping station to the present distribution system. The site of the intake has been approved by the State Board of Health, but the method of filtration, not yet selected, must meet with their approval. The pollution of the river above the water works intake consists of the sewage of the eastern part of the city and the sewage of Bellevue, Dayton and part of Newport, also sewage brought down by the Little Miami river. The Cincinnati Health Department has a list of 21 sewers which empty above the water works; two of these are storm sewers only, but the drainage is from the dirty streets and yards and makes it almost as objectionable as the true sewage. It is impossible to estimate the number of people tributary to these sewers, but it is not large compared with the population of Cincinnati, as intercepting sewers carry much of the sewage below the water works.

Sewerage—Cincinnati has the combined system of sewers with outlets to the Ohio river and to Mill creek. The sewers empty at the most convenient point into the streams, but seem to cause no nuisance, owing to the large amount of water usually available. This is not true, however, of Mill creek, which is badly polluted and has for many years been a source of annoyance. The sewers cover the large central portion of the city, leaving only the outskirts unprovided. No estimate can be given of the sewer connections, as no records have been kept.

Vaults must be 10 feet deep, constructed of masonry and cement and eight feet from wells and cisterns. Owing to the poor construction of the vaults and the short distance, the well water cannot help being polluted.

BELLAIRE, Belmont county, population 12,036. The city is supported almost entirely by its mining, iron and clay interests. The river's bank is lined with large blast furnaces and steel plants, which give employment to large numbers of men. The city has paved streets and electric lights, but it has a somewhat dirty appearance, as might be expected from the nature of its industries.

Water Supply—The water works is owned by the city, and has cost to date about $200,000. The first supply was introduced in 1872, the water being taken from the river just above the outlet of Indian run.

In 1884 a new intake just below the creek was put in. These two furnish the water for the city at the present time, though the water before it reaches the intake is polluted by the sewage of the city itself. The sewage from the northern part of the city empties into Indian run some distance back from the Ohio river. The sewage then flows down to the river right over the old intake and then goes on to the new one. To make matters worse, a large steel plant just north of the run has dumped a large amount of ashes and slag into the river until quite a projection is formed. This causes the water in the river to eddy just below it, so that some of the sewage that empties into the river below the water works is carried up stream and over the intakes. Besides their own sewage the Bellaire water works receives the benefit of the sewage of Martin's Ferry, Bridgeport, Wheeling Island and Wheeling, all within five miles of the intakes. These cities represent a population of 53,700. Of these, 36,500 are accessible to the sewers and some 9,000 are already connected.

The water is lifted by two pumps to a reservoir 215 feet above the low water mark of the river. One pump, built in 1878, is of single acting plunger type, with four pump cylinders at the water level, operated by an engine and gearing, giving a daily capacity of 500,000 gallons. The other pump is of the same pattern, only the cylinders are double acting. This pump was put in in 1884, and has a capacity of 2,000,000 gallons per 24 hours. The pumps are old style and in pretty bad shape at present.

The reservoir has a capacity of 1,500,000 gallons when the water stands 14 feet deep. It is carefully constructed of brick laid in cement, and is fully protected from surface water. The reservoir is cleaned every year and no trouble is experienced from growths of any kind.

Nearly every one in the city has access to the water mains. There are 1,785 services in use, of which two, used by railroads, are metered. The average daily consumption is 2,000,000 gallons. It is estimated that the three large enameling works use one-third of this. Leaving out these manufacturing plants, the average daily consumption per capita for the population actually supplied is about 125 gallons. The water rates are as follows:

Private houses, three rooms or less	$5 00
" " each additional room	75
" " each additional person over five	65
" water closets, each	2 00
" bath tubs, each	3 25
" stables, per head	1 50

There are no strictly private wells in the city. The wells are on the streets or public squares and the water is carried far and near. There are seven of these public wells, averaging 75 to 100 feet deep, and driven into the gravel bed to the level of the river. There are no dug wells in town.

Sewerage—The combined system of sewers is in use, with outlets to the McMahan creek, Indian run and Ohio river. About 75 per cent. of the inhabitants has access to the sewers and probably half of these are connected. The sewers emptying into the Indian run and McMahan creek cause a nuisance in dry weather, as these two creeks are practically dry.

As stated above, parts of the sewage system pollute the city water supply.

Vaults are required to be water-tight, but few are so constructed, the great majority being walled up with boards. No distance is specified from wells.

Night soil is carried to the country and buried.

Bridgeport, Belmont county, population 4,579; and Martin's Ferry, Belmont county. Population 9,736. These two towns are practically one, as far as location is concerned; the corporations join. They are typical river towns, supported by the iron industries and the coal mines. They both have paved streets, electric lights, a few sewers and a common water supply.

Water Supply—Martin's Ferry has a public water supply, put in by the city in 1887, which had cost to January 1, 1898, $167,000. Arrangements have been made by which Bridgeport has the use of the Martin's Ferry water at the same rate as the citizens of that town enjoy. Bridgeport owns and controls its own mains, which were put in shortly after the completion of the works by Martin's Ferry. The citizens of the former town are dissatisfied, however, and are contemplating the erection of a plant for themselves, but they will have difficulty in securing a site as favorable as that of the Martin's Ferry station. This pumping station is situated on the banks of the Ohio river above the city and away from all local pollution. The first source of this is the sewage of Mingo Junction and Steubenville, 19 miles above. Of course the Ohio river receives more or less pollution from surface drainage between these points, but the amount is insiginificant when compared with the large amount of water usually coming down the river.

The water is pumped from the Ohio river to a reservoir 300 feet above low water. This reservoir has a capacity of 2,500,000 gallons, with a depth of 10 feet. It is cleaned every year, nothing but the mud settled out of the water is removed, and there is no trouble from growths of any kind. The sides ot the reservoir are riprapped and the bottom paved and cemented.

There are two pumps in the station, both vertical, compound, duplex pumps, with differential plungers. One is a Gordon-Maxwell of 1,000,000 gallons capacity, erected with the works in 1887. The other is a 2,000,000-gallon Hughes pump, put in in 1893. The average daily consumption is 1,500,000 gallons, of which it is estimated one-third is used by Bridgeport. Practically all of both towns have access to the water mains. In Martin's Ferry there are 1,133 services in, of which 1,037 are in use, six of these being metered. In Bridgeport there are 425 services in use, of which only one is metered. The average daily consumption per capita for the population actually supplied is 160 gallons.

The water rates are as follows, alike for both towns:

Private house, two rooms	$4 44
" " four rooms	6 38
" " six rooms	8 04
" " ten rooms	11 40
" " each additional room	84
" bath tubs, each	3 34
" water closets, each	3 34
" stables, per stall	1 66

Meter rates per 1,000 gallons:

Five hundred gallons or less per day	30
One thousand to 2,000 gallons	20
Three thousand or over	10

There are no wells in use in Martin's Ferry, but it is estimated that 30 per cent. of Bridgeport's population use well water, a few, filtered cistern water, and the rest the public supply. Private wells are from 30 to 40 feet deep, getting the water in the gravel bed at the river level.

Sewerage of Bridgeport—Bridgeport has the combined system of sewers, with outlets to the Ohio river and Wheeling creek. It is estimated that 90 per cent. of the population have access to the sewers and that 25 per cent. of these are connected. This would give about 1,000 people the use of the sewers, with some 4,000 so situated as to be able to use them if they so desired. The sewage seems to cause no nuisance and does not pollute the public water supply in any way.

Vaults are constructed of planks and are in a very bad condition generally. During the hard rains the vaults are filled and the ground soaked with the filth washed from them. This could be remedied by making the vaults water-tight and by cleaning them frequently. Night-soil is taken to the country and buried.

Sewerage of Martin's Ferry—Martin's Ferry has a rather poor sewer system. The combined system is used, with three main outlets to the Ohio river. Not more than 25 per cent. of the city's population has access to the sewers, and not a fourth of these are connected. This gives some 600 people the use of the sewers and only 2,500 accessible to them. The sewage causes no nuisance and does not pollute the local water supply.

Vaults are mainly constructed of planks and very few are water-tight, but this does not make so much difference here, as it is claimed that there is not a well in use in Martin's Ferry. Night-soil is buried in the country.

East Liverpool, Columbiana county, population 20,000. This town is one of the growing manufacturing centers of the State. It has electric cars and lights, paved streets, a water supply and a fair sewer system. The principal industry is the manufacture of all kinds of brick, tile and pottery.

Water Supply—The water works was put in by the city in 1879, and has cost to date about $210,000. The supply is from the Ohio river and through a 30-inch intake 480 feet long and leading to a small pump well. The water works is situated above all local pollution, the nearest serious sewage pollution being Allegheny and Pittsburgh, some 35 miles above.

The water is pumped to the low service reservoir 320 feet above the river, and, by an auxiliary station, pumped from here to the high service reservoir, 280 feet above the first, or it can be pumped direct to the upper reservoir from the intake station.

The low service reservoir has a capacity of 2,500,000 gallons, with a depth of 19 feet, and the high service one holds 1,500,000 gallons, with a depth of 15 feet. The reservoirs are both built of brick laid in cement, and both are without covers. The lower reservoir has to be cleaned twice a year, a large amount of mud being removed; the upper one not so often on account of the sedimentation the water receives in the first one.

The main pumping station contains two pumps of 5,000,000 gallons total capacity. One is a vertical compound, duplex Cope and Maxwell pump of 1,500,000 gallons capacity, erected in 1880. The other is a vertical compound, duplex Gordon pump of 3,500,000 gallons capacity, put in in 1892. Both of these pumps can be run single or duplex.

The upper reservoir and pumping station were built in 1892. This station contains a horizontal compound, duplex Gordon pump of 2,000,000 gallons capacity. There are some 23 miles of mains, giving 80 per cent. of the population access to the water. There are 1,600 services in use, with 10 of these metered. The average daily consumption is 2,000,000 gallons, and the average per consumer is 200 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$6 65
" " each additional room	1 00
" " each additional family	6 65
" water closets, each	3 04
" bath tubs, each	3 33
" stables, one horse and carriage	3 33

Meter rates per 1,000 gallons:

Two hundred gallons or less per day	40
Five hundred gallons to 1,000 gallons per day	25
Twenty thousand to 50,000 gallons per day	7

The public water supply is used for domestic purposes by nearly every one that has it. There are about 250 private wells in use; these are mostly dug and from 20 to 60 feet deep, the lower ones getting their water in the river gravel.

Sewerage—The storm water is conducted to the river through gutters principally, there being but few storm water drains in use. There are about eight miles of sanitary sewers in, with two outlets to the Ohio river. Some 60 per cent. of the population have access to the sewers. There are 630 connections to these, representing about 4,000 people.

No new vaults are being allowed where access to the sewers can be had. The old vaults are not water-tight and no distance from wells is specified. Night-soil and garbage are dumped into the river or buried along its banks.

IRONTON, Lawrence county, population 13,229. This city is the county seat of Lawrence county, and one of the principal manufacturing towns in the southern part of the State. It has a number of well-paved streets, street cars, water works, and a sewer system. The whole river front is lined with manufacturing plants, iron, clay and lumber being the principal products handled. Besides these staples there is a large amount of general manufacturing.

Water Supply—The water works was put in by the city in 1871, and has cost to date $192,000. The supply is direct from the Ohio river at a point opposite the lower part of the city. The water is pumped direct from the intake pipe to the mains, so the city has to take the water as it comes. A reservoir will soon be put in which will help the water some. The local pollution of the river must be called serious. On the river bank above the water works there are five large lumber yards and mills, three iron furnaces, two fire brick plants, a nail mill and soap works. The surface drainage from all these plants goes direct to the river. The banks are practically made up with their refuse, including enormous heaps of decaying sawdust. The nail mill seems to send no acid to the river, as it has a drain to a creek which empties below the water works. The soap works has a sewer direct to the river, through which is discharged the refuse of the plant. This is a very offensive pollution. Three storm water sewers enter the river above the water works, bringing in the dirty surface water of a part of the city.

Big Ice creek enters the river 2¾ miles above the water works; it brings in the drainage of the principal cemetery, the polluting influence of which is uncertain. The county infirmary is located about one-fourth of a mile from this creek and one-half a mile from the river. It has some 85 inmates, the sewage from whom is emptied over a bluff and soaks away into the ground. This may in time cause some pollution, but does not as yet.

Of the towns above Ironton the following are within ten miles: Ashland, Catlettsburg, Sheridan and Coal Grove. Of these, the only one of importance is Ashland, Ky.; this is a growing town of some 6,000 people. It has a partial system of sewers and is at present extending them. There are as yet but few connections and the pollution of the river is not serious, but will be in time.

When the sewerage system of Ironton was put in the principal question was whether to carry the sewage below the present intake or to move the water works farther up the stream. On account of the growing pollution of the river above, it was decided to keep the water works in its present place as far removed from the pollution above as possible, and to carry all the sewage of Ironton below the intake.

The intake is 16 inches in diameter and extends 140 feet from low water mark into the river. The water is pumped direct by two vertical, duplex McDonald pumps of 1,250 000 gallons capacity each. One of these pumps was put in place in 1884 and the other in 1892.

There are 209 miles of mains in, giving some 90 per cent. of the population access to the water. There are 1,650 services in, of which some 1,600 are in use. None of these are metered, as the water is too muddy to permit of their use. The average daily consumption is 1,400-000 gallons and the average per consumer is 145 gallons.

The annual water rates are as follows:

Private houses, one family, one room	$5 00
" " each additional room	50
" bath tubs, each	3 00
" water closets, each	5 00
" stables, one horse and carriage	4 00

Cisterns furnish the principal supply of water for domestic use. These are usually filled with river water, but in a number of cases with rain water. It is said that there are but three wells in town and two of these are not in use; the only one used is a drove well some 130 feet deep.

Sewerage—Ironton has essentially the separate system of sewers. Part of the system carries off storm water and sewage and part acts as an intercepting sewer. Rachel creek flows nearly the whole length of the town, one-fourth of a mile back from and parallel to the river, and empties into the latter below town. This creek carries nearly all the storm water of the town, four small sewers carrying off the remaining portion. Owing to the location of the water works it was necessary to carry all sewage to the lower end of the city, so a sewer was laid under the bed of Rachel creek.

This main sewer is the outlet of all sanitary sewers and also receives the dry flow of a few combined sewers, the storm flow of which passes direct to the ditch. This method keeps all the sewage out of the creek and prevents a nuisance. There are now 3.92 miles of combined and sanitary sewers in, and the system is being rapidly extended. There are 558 connections made to the sewers, and some 40 per cent. of the total population have access to them.

Vaults are now being done away with as rapidly as the sewer system is extended and the connections made. The vaults in use are from 20 to 60 feet deep, going into sand and gravel near the river level. No attempt seems to be made to clean these out, and new ones are dug as required.

MARIETTA, Washington county, population 12,084. This town is the county seat and the oldest place in the State. It has some manufacturing, but the present life of Marietta is the oil boom. It has some fine paved streets, street cars, electric lights and a water supply.

Water Supply—The water works was put in by the town in 1890, and has cost to date $127,525. The supply is direct from the Ohio river through two intake pipes, each 275 feet long and sixteen and eight inches in diameter respectively. When the plant was first put in it was intended to obtain a ground water from a large well near the river, but the supply was too small and the water objectionable, so direct connection had to be made to the river. The lower part of this well was filled up and the well used to set the horizontal pump in.

The nearest serious sewage pollution of the Ohio river is the cities of Bellaire and Wheeling. some 75 miles above. There are a number of small towns which send some sewage to the river, the nearest of which is seven miles away. This latter place is a small village, with but a few private sewers.

The water is pumped to two tanks by two Gordon pumps, both put in in 1891. One of these is a horizontal duplex pump of 750,000 gallons capacity; this one is placed in a well so as to be within the suction limit for low water. The other pump, put in in the same year, is a vertical compound, duplex pump of 1,000,000 gallons capacity. The tanks are on the hills back of town, which gives them an elevation of 206 feet above the pumping station. There are two steel tanks, each 66 feet in diameter and 30 feet high, giving a combined capacity of 1,500,000 gallons. There are a little over 21 miles of mains in, giving some 95 per cent. of the population access to the water. There are 1,211 services in, of which about 1,100 are in use and about five of these metered. The average daily consumption is 1,250,000 gallons and the average per consumer is 200 gallons. A great deal of water is used in the flush tanks attached to the sewer system.

The annual water rates are as follows:

Private houses, one to three rooms	$3 00
" " four rooms	4 00
" " five rooms	5 00
" " each additional room	50
" bath tubs, each	3 00
" water closets, each	2 00
" stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	35
One thousand five hundred to 3,000 gallons per day	25
Over 20,000 gallons per day	10

The city water is in general use now, but there is a great deal of complaint on account of its muddy condition for a greater part of the year. The private water supply is limited, there not being more than a dozen wells in use. These are 30 to 40 feet deep, obtaining their water in a bed of gravel at the river level.

Sewerage—Marietta has a system of sanitary sewers with three outlets direct to the Ohio river. These sewers are flushed by tanks and some roof water. The storm water is carried off by surface drains and gutters. There are some 10.3 miles of sanitary sewers in, giving a large percentage of the population access to them. There have been 620 permits issued to tap the sewers, nearly all of which are for water closets. No vaults are allowed to flush to the sewers. The flow from the main sewer, a 2-foot tile, cannot reach the channel of the river during low water, and this causes some nuisance. New vaults must be water-tight, but the old ones are not so constructed and are in bad shape.

Night-soil is buried in the country. Garbage is dumped on the low banks of the Muskingum river.

PORTSMOUTH, Scioto county, population 13,446. Portsmouth, the county seat of Scioto county, is one of the oldest towns of the State. Its industries consist of the usual river trade and some manufacturing. It has a number of well-paved streets, with suitable storm sewers and water supply, but no sanitary sewers whatever.

Water Supply—The water works was put in by the city in 1871, and has cost to date $185,000. This cost includes the bonds only, and not the amounts spent from the annual revenues. The supply is direct from the Ohio river at a point opposite the upper end of the town. This point is above all local pollution and 27 miles below Ironton, the first serious sewage pollution of the river. Sciotoville is only six miles above but it is a small village with no sewers.

The water is pumped from the river through two intake pipes, each 20 inches in diameter and extending 550 feet into the river from low water mark. At the end of each pipe is a perforated copper strainer. The water is pumped direct to the mains by two pumps, one a vertical compound, duplex Laidlow-Dunn-Gordon pump of 6,000,000 gallons capacity and the other a vertical compound, duplex Worthington pump of 3 000,000 gallons capacity. The first was put in in 1894 and the other in 1892. It is difficult to keep the pumps in repair owing to the large amount of sand pumped bodily from the river.

There are 25½ miles of mains, which give some 95 per cent. of the population access to the water. There are 3,000 services in, of which 2,550 are in use. Meters cannot be used on account of the mud and sand. The average daily consumption is 1,750,000 gallons and the average per consumer is 185 gallons.

The annual water rates are as follows:

Private houses, four rooms or less		$6 00
"	" each additional room	1 00
"	bath tubs, each	4 00
"	water closets, each	4 00
"	stables, one horse and carriage	3 00

There are no private wells in use in Portsmouth. Nearly every one uses the city water, many storing it in cisterns first, to allow sedimentation and to tide over the worst stages of the river. Some of the cisterns are filled with rain water.

Sewerage—There are about 10 miles of storm sewers in use, with one outlet to the Ohio river and two to the Scioto river. Bath and sink connections are made to the storm sewers, but no water closets are allowed, though it is said three or four connections have been made. There are no sanitary sewers in use, every one using the outdoor vault or cesspool. These vaults or cesspools are 20 to 50 feet deep, going into the river gravel, which carries off the liquid, allowing them to fill up slowly with solid matters. When they are full, new ones are dug beside the old and the process repeated. A shoe factory has a large yard punctured with these holes full of filth. This system has polluted the ground water to such an extent that wells are out of the question.

STEUBENVILLE, Jefferson county, population 14,534. Steubenville is he county seat of Jefferson county, and one of the oldest cities in the State. It has quite a number of well-paved streets, fine residences, electric lights, water works and some sewers, all indicating a prosperous community. The principal industries are iron, glass and clay manufacturing, together with more or less coal mining.

Water Supply—Steubenville has had a public water supply since 1810, and the city has always owned and controlled it. The plant complete is valued at $256,457, of which $201,137 has just been spent on the new water works, and the remainder is the valuation of the old plant. The Ohio has always been the source, and will probably so continue to be.

In 1895 a new pumping station was built north of the city, the old one being down in the heart of the business district. The new intake is near the West Virginia side of the river, the channel being on that side at this point, and above all local contamination, a great improvement in this respect over the old location. The only local pollution of the Ohio at the present location of the intake is from the village of Toronto (population 5,000), 6½ miles above the water works. Wellsville (population 7,800) and East Liverpool (population 26,000) are only 18 and 21 miles respectively above the intake. It is not to be expected, however, that the river fully recovers from the effects of the sewage dumped into it from the dozen or so cities within less than 75 miles; dilution is the only thing that makes the water at all potable.

The water is pumped from the river through two 24-inch intake pipes, which are laid in a trench in the bed rock of the river over to the channel on the West Virginia side. It is claimed that the river is 20 feet deep here during the lowest stages. The two pumps in use now were put in by the E. P. Allis Company in 1895. They are vertical compound, duplex pumps of 3,000,000 gallons capacity each. The water is pumped to a new reservoir having a capacity of 5,000,000 gallons and 312 feet above the pumps. This reservoir supplies direct the high pressure mains used for domestic service. The water flows from this high pressure reservoir to two lower reservoirs. These low pressure reservoirs belong to the old works and have a combined capacity of 2,000,000 gallons. They are about 100 feet above the city, while the high pressure reservoir is 250 feet above. Thus 150 foot pounds of work are lost on every pound of water consumed by a large part of the domestic services of the city. The reservoirs are all paved and cemented, but not covered. They are cleaned once a year by scraping and flushing out the mud.

There are something over 17.5 miles of mains in the low pressure system and about 10 in the high pressure or fire system. These mains give practically the whole population access to the water. There are 3,500 services in, with none metered. There are 2,800 families using the city water, the rest of the services being to shops, stores, etc.

The average daily consumption is 2,200,000 gallons, allowing 2 per cent. for slip of the pumps. The average daily consumption per consumer is 145 gallons.

The annual water rates are as follows:

Private houses, two rooms or less	$2 00
" " each additional room	1 00
" water closets, each	4 00
" bath tubs, each	2 00
" stables, one horse and carriage	2 00

Meter rates range from five to 50 cents per 1,000 gallons.

The city water is used almost entirely; there are very few private wells in use. There are a few dug wells 40 to 50 feet deep and a few springs used for domestic purposes.

Sewerage—There are about 2.7 miles of sewers, with two outlets to the Ohio river and one to Wells run. They carry off some storm water, but most of that is taken care of by surface drains. There are 380 water closets connected to the sewers, representing about 2,280 people. The sewage causes no nuisance, and now causes no pollution of the water supply. There are no vault regulations. Vaults are usually constructed of brick or plank. . Garbage is dumped over the river bank. Night-soil and dead animals are buried in the flats near the river.

TORONTO, Jefferson county, population 5,000. This village is supported almost entirely by the tile industries. It has electric lights, some paved streets and a water supply, but no sewer system.

Water Supply—The water works were put in by the village in 1891, and have cost to date $80,000. The supply is from the Ohio river, through a 16-inch intake, 550 feet long, leading to a small pump well filled by gravity. During high water this well is filled almost to the pumps and sometimes over them. The local pollution to the supply is the small amount of sewage from Wellsville, 10 miles above, and East Liverpool, 13 miles above.

The water is pumped to a reservoir by a vertical compound, duplex Gordon pump of 1,500,000 gallons capacity. The plungers of the pump are 38 feet below the steam cylinders. The reservoir is 325 feet above the pumps and has a capacity of 3,000,000 gallons. It is 145 by 185 feet, giving an area of .65 acres. The sides are made of rubble laid in cement and the bottom is grouted. The reservoir is cleaned out every year. The intake is covered with gravel, and the water of the reservoir can be turned back into the pipe to wash the sand and mud out of the same. It is the aim to fill the reservoir only when the river is clear, and as it holds a ten days' supply, this can be done to some extent

There are nine miles of mains, giving about 90 per cent. of the population access to the water. There are 400 services in use, with three metered. The average daily consumption is 300,000 gallons and the average per consumer is 125 gallons. It is estimated that 90 per cent. of the people drink cistern water. There are not more than a dozen private wells in use.

Sewerage—The surface drainage and sewerage is direct to the Ohio river. There is only one sanitary sewer in town; this covers the three principal streets. There are several storm water drains, some emptying into the river above the water works intake. There are about 25 connections to the sanitary sewers and three or four to the storm sewers. There are several private sewers to the river and a few enter above the water works. The per cent. of the total population having access to the sewers is very small, less than 10.

Vaults are not regulated in any way and none are water-tight. Garbage is dumped over the river bank and night-soil is hauled to the country.

WELLSVILLE, Columbiana county, population 7,800. This village has electric lights, paved streets, electric cars, a public water supply, but no sewers. It is supported principally by its large railroad interests.

Water Supply—The water works were put in by the village in 1881, and have cost to date about $70,000. The supply is from the Ohio river, through a 10-inch intake pipe 600 feet long. The pumps are connected direct to the pipe, the end of, which is perforated to act as a screen.

The local pollution of the river is from the sewage of East Liverpool, only three miles distant. The sewage of some 4,000 people in this city is sent direct to the river. The water is pumped to the reservoir by a horizontal compound, duplex Worthington pump of 1,500,000 gallons capacity, erected in 1895. There is an old Worthington pump of the same capacity, put in in 1881, but this is not in use. The pumps are down in a well to bring the river water within suction distance. The reservoir is 350 feet above the pumps and gives a pressure of about 100 pounds on the streets. It is round and has an area of .6 of an acre. The sides of the reservoir are bricked, but not cemented, and are badly overgrown with weeds. The reservoir is cleaned out every year and is in bad condition. There are about eight miles of mains in, giving 90 per cent. of the population access to the water. There are 750 services in use and none are metered.

The average daily consumption is said to be 1,250,000 gallons, but must be less, as this would give an average per consumer of 300 gallons, which is much too large for this town.

The annual water rates are as follows:

Private houses, five rooms or less	$5 00
" " each additional room	1 00
" bath tubs, each	3 00
" water closets, each	2 50
" stables, one horse and carriage	3 00

There are but few private wells in use; these are drilled and get their water in the river gravel. Five of six dug wells get surface water only 15 to 20 feet down. Many families use cistern water for domestic purposes.

Sewerage—There are no sanitary or storm sewers in use. The surface drainage is to the Ohio river, through ditches and gutters. There are about 15 private sewers to the river, to which some 50 families have water closets attached.

Vaults must be 15 feet deep and constructed of brick or stone. None of them are water-tight and no distance is specified from the wells. Night-soil is hauled to farms. Garbage is buried on vacant lots.

(*b*) INTERIOR STREAMS.

The reports upon the water supplies of Defiance, Findlay, Toledo and Napoleon will be found with the special report on the Maumee watershed, and those upon Bucyrus and Upper Sandusky will be found with the special report on the Sandusky watershed. These two reports accompany this report.

ALLIANCE, Stark county, population 11,878. This is one of the many manufacturing towns in the Mahoning Valley. The principal industries are the engineering works, foundries, boiler works, etc. Alliance has a good sewer system, a water works, paved streets and electric lights.

Water Supply—The water works were put in by a private company in 1883. On April 1, 1899, the plant was purchased by the city for $198,000.

The supply is taken from the Mahoning river, just north of town, where the river has a watershed of 73 square miles. This area is devoted almost entirely to agriculture and dairying, there being only a few small country coal banks. There are also several creameries and cheese factories, which were reported to be in good condition, causing no nuisance.

The Fairmount Children's Home, having some 200 inmates and officers, is two miles south of Alliance, and is situated on a small run that empties into the river above the city. They have an underground system of sewage disposal which has worked well so far, but in case of stoppage the sewage would enter the river and endanger the Alliance water. The most serious pollution to the water, however, is a run which passes through part of Alliance and through East Alliance carrying surface drainage and some sewage. It is reported that several private sewers empty into this run, also the drainage from two large manufacturing plants and a hotel.

An intake pipe entering the river above a dam carries the water to a canal, through which it flows for about 600 feet, emptying into a subsiding reservoir, then flowing through another canal about 800 feet long to the pump well. The dam is 125 feet long, six feet high and backs the water up five miles. Five feet of the river water is available for water supply at the dam, but sand bars prevent the water in the upper part of the river from coming down, so that on an average two feet of water is available, or about 25,000,000 gallons, unless the bars are cut through when more could be obtained.

The reservoir is 300 by 400 feet and 3½ feet deep, giving a storage capacity of 3,000,000 gallons. The reservoir and canals are excavated in a mixture of clay, sand and gravel, forming a very fair bottom.

Owing to the rapid growth of water grass and moss in the reservoir, it must be cleaned once a month during the summer or about six times a year. After the first spring cleaning only a small amount of mud is removed each time.

The water is pumped from the small pump well to a standpipe by two pumps, the one put in in 1883 is a compound, duplex Worthington pump of 1,000,000 gallons capacity; the other put in in 1892 is a compound, duplex Worthington of 2,000,000 gallons capacity. The standpipe is 95 feet high, 20 feet in diameter and has a capacity of 220,000 gallons.

There are 13 miles of mains in, giving some 50 per cent. of the population access to the water. There are 1,153 services in, of which 1,000 are in use, and of these 30 are metered. The average daily consumption is 1,400,000 gallons, and the average for each consumer is 230 gallons. The railroads use about 237,000 gallons of water daily, which subtracted from above would make the average daily consumption about 190, which is still much too large, and could easily be reduced by the general introduction of meters.

The average water rates are as follows:

Private houses, one family	$6 00
" bath tubs, each	5 00
" water closets, each	5 00
" stables, one horse and carriage	3 50

Meters are charged a small annual rental, depending upon size. The rates for dwellings per 1,000 gallons is 50 cents and for manufacturing establishments 25 cents.

The city water is in general use where available. The private wells are usually dug and from 15 to 20 feet deep, entering the shale where the water is found.

Sewerage—Alliance has the separate system of sewers. There are 8.6 miles of sanitary sewers in, giving some 75 per cent. of the population access to them. The surface drainage is taken care of by 4 5 miles of storm sewers and by ditches and gutters. Parts of the storm water sewers consist of the old combined sewers, and these are said to have a few closet connections to them still. One of the particularly objectionable storm drains, as mentioned above, empties into the river above the water works. There are 274 connections to the sanitary sewers, most of which are for water closets. The sanitary sewers are connected to a main leading to a chemical disposal works situated on the river bank opposite the water works. This plant was completed July 1, 1896, at a cost of $20,755.62. The operating expenses, repairs, etc., for 1898 were $1,611.75.

The sewage is received into the plant mixed with lime, conducted to the settling basins without previous screening of any kind, there the sludge is precipitated and the clarified effluent is permitted to pass to the river.

There are three precipitation tanks, 40 by 80 feet, and when full containing six feet of sewage. These are constructed in a substantial manner, with brick walls covered with stone copings, and each connected by suitable piping to a common sludge well of similar construction. When it is necessary to clean out a tank it is disconnected from the rest, the sewage is allowed to settle, the clear water drawn off by a skimmer pipe and the sludge flushed to the sludge well, from which it is pumped to the filter press and pressed into cakes. These sludge cakes are carted to a dump, which is the only nuisance of the plant, as the stuff is gradually collecting, not being hauled off fast enough.

The chemical mixers, filter press, sludge pumps, effluent pumps, boilers, etc., are all housed in a substantial two-story brick building. On account of the low level of the bottom of the basins, they cannot be drained directly to the river during high water, and so must be drained to a clear water well, from which the water is pumped to the river.

During the year 1898, 176 tons of coal and 64¾ tons of lime were used, 130,000,000 gallons of sewage were treated and 227 tons of sludge precipitated and pressed, or a daily average of 964 pounds of coal, 355 pounds of lime, 1,241 pounds of sludge, 356,000 gallons of sewage, and a daily cost of $4.415.

This gives an average of seven grains of lime to each gallon of sewage, from which resulted about 24 grains of sludge. The effluent is slightly milky, but causes no nuisance in the river.

The construction of vaults is not regulated, so none are water-tight. Night-soil and garbage are hauled to any available farm.

Cambridge, Guernsey county, population 6,329. Cambridge is a country town, supported by the neighboring farmers and coal miners. It has a few paved streets, a water works, and is now putting in a few sewers.

Water Supply—The water works were put in by the city in 1896, and have cost to date $60,000. The supply is from Wills creek, a sluggish, muddy stream winding in and out among the hills from which every rain washes down the clay and dirt. The only source of pollution within ten miles is the village of Byesville, some six miles up the creek. This place has a population of 1,000. It has no sewers, but all the drainage from yards and streets finds its way direct to the creek. Hog pens are located on the banks of the creek and cattle have access to it at all times. A great deal of water is pumped to the creek from the coal mines.

A small dam in the creek backs the water up over the intake, from which it is pumped to a standpipe by a horizontal compound, duplex Dunn-Gordon pump of 3,000,000 gallons capacity. The standpipe, located on a hill between the station and the city, is 60 feet high and 25 feet in diameter, giving a capacity of 200,000 gallons.

It is estimated that 75 per cent. of the population have access to the water mains. There are 110 services in use, of which 100 are metered. The average daily consumption is 600,000 gallons and the average per consumer is 90 gallons. None of the water is used for domestic purposes, the consumption above mentioned being due to the use of the water by railroads and factories.

All water is supposed to be sold by meter, and meter rates only are quoted in the rules and regulations.

Meter rates per 1,000 gallons:

Less than 100,000 gallons per year	$0 25
Two hundred and fifty thousand to 500,000 gallons per year	15
Over 750,000 gallons per year	8

Private wells furnish fair water, as there are but few vaults in use and these are water-tight. The majority of the wells are dug and from 20 to 30 feet deep, obtaining their water just above the shale, which is found at that depth. There are a few drove wells on the hills, which go through the shale to the sandstone; these furnish a good water, as the shale keeps out most of the surface drainage.

Sewerage—The village is just putting in a sewer on one of the principal streets. It will empty into Wills creek below the water works, and, as it will have but a few connections for some time, will probably cause no nuisance.

There are but few vaults in use, the dry earth closet being the most common substitute. Night-soil is taken to the country and buried.

Dennison, Tuscarawas county, population 5,278. Uhrichsville, Tuscarawas county, population 5,123. These two villages can very appropriately be considered together, as they have a common water supply. They lie on opposite banks of the Big Stillwater creek, which forms the boundary between them. Both of the places are manufacturing and railroad towns, and dirty and smoky as such towns always are. Each has a number of paved streets, electric lights and the use of water from one of the public works.

Water Supply—Both villages are supplied with water by the Dennison Water Supply Company. There are separate contracts with this company, but they are practically the same for each.

The water clause in the contract with the village of Dennison reads as follows: "The water shall be from filtering galleries or wells adjacent to the Big Stillwater creek, with direct connection to the creek to be used in cases of emergency." The contract is for twenty years, date September 5, 1887. The plant can be purchased by the city any time after fifteen years have elapsed.

The company is at present taking the water direct from the creek, as a new filter is being put in. The water was taken at first by means of a gallery as required in the contract, but the fine mud of the creek soon made the walls of the gallery impervious and direct connection had to be made to the creek. The filter now under construction is fifty-eight by ninety-eight feet, and will contain three feet of gravel and sand screened into three layers from ordinary river gravel. The water will pass direct from the creek to a small well, then on to the filter bed, being collected after passing through the sand by underdrains and emptying into a pump well. There will be nothing to regulate the rate of filtration except the rate of consumption. This filter will be counted a success if it removes the fine yellow clay with which the water is burdened the greater part of the year.

The water is lifted by two pumps two hundred and fifty feet to a reservoir on a hill overlooking the cities. One is a horizontal, compound, duplex Holly pump of 2,000,000 gallons capacity put in in 1892 and the other is a horizontal Worthington pump of 1,000,000 gallons capacity put in in 1888 when the works were first started. The reservoir, capacity 3,000,000 gallons, has brick sides and bottom and no surface drainage can reach it.

Big Stillwater creek above the intake has very little fall. The creek winds in and out among low hills which furnish the clay with which the creek is loaded three-fourths of the time. Most of the land bordering the creek is in pasture. There is only one village, Newport, within ten miles. It is a small place polluting the watershed no more than so many farm houses.

It was very difficult to obtain all the information desired. The number of services in either town could not be learned. The average daily consumption is 1,300,000 gallons. This is due to the large amount used by the railroads. It is estimated that about nine-tenths of Dennison has access to the water and about seven-tenths of Uhrichsville. No one drinks the public water on account of the mud and bad color.

The water rates are as follows:

Private houses, six rooms or less	$5 00
" " each additional room	75
" bath tubs, (cold) each	2 50
" bath tubs, (hot) each	3 50
" water closets, each	5 00
" stables, one horse	3 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	35
One thousand to 2,000 gallons per day	25
Over 10,000 gallons per day	15

The private wells in the two cities are mostly dug, the depths ranging from 12 to 50 feet. Owing to the common use of vaults the wells cannot furnish the best of water yet, well water is depended upon almost entirely for domestic purposes.

Sewerage of Uhrichsville—Uhrichsville has the separate system of sewers principally, there being a few storm sewers that have house connections. The sewers empty into Big Stillwater and into Little Stillwater creeks. About 60 per cent. of the population has access to the sewers, but not half of these have connections in. It is estimated that some 1,200 people use the sewers. The one outlet into Little Stillwater creek causes a nuisance when the creek is low. The storm water is taken care of mainly by surface drains supplemented by a few short tiles to which there have been made several house connections.

Vaults are required to be water-tight or of the dry earth pattern. These rules are not strictly enforced however, and they are usually built to suit the owner. No distance is specified from wells.

Sewerage of Dennison—Dennison has combined sewers, all of which empty into the Little Stillwater creek. The sewage of Dennison in connection with that of Uhrichsville makes this creek pretty foul below the outlets especially in the dry summer weather. While about one-half of the village's population has access to the sewers, but very few are connected to them. It is estimated that the sewers are used by about eight hundred people.

Vaults are required to be water-tight but are not so built, every one in town leaking. Quite a number are now being built of thirty-six-inch tile, closed at the bottom with cement forming a tight vault. Night-soil is carried out to the country and buried.

ELYRIA, Lorain county, population 8,252. Elyria, the county seat of Lorain county is one of the prettiest small cities in Ohio. Its connection by electric cars with Oberlin, Cleveland and Lorain makes it an ideal residence place. It has some manufacturing. Its water supply is poor and the question of a new one is being discussed.

Water Supply—The water works were put in by a private company in 1879. On July 1, 1898 the city obtained control of the plant for a consideration of $45,000. The plant originally cost much more than this. The supply is from the west branch of Black river. The water is impounded by two dams, the first one is at the southern edge of town near the water works and the second is a little over one and a half miles farther up the river. The dams are each eight feet high and one hundred and thirty feet long, but the first backs the water up one mile and the second two and a half miles. It is estimated that the combined storage capacity of the two impounding reservoirs is 150,000,000 gallons. This figure is much too high, probably 75,000,000 gallons is nearer the actual capacity. The purity of the water must be affected seriously by some of the following sources of pollution: the surface drainage of the villages of Oberlin, Lagrange, Rochester and Wellington, the effluent from the Oberlin sewage farm, and the sewage from the county infirmary. As Oberlin is a clean, well-sewered town its surface drainage is not as foul as it would be otherwise. The drainage from the small villages mentioned is not much different from that of the whole watershed which is very thickly populated. The influence of the Oberlin sewage farm in not known. The effluent of the farm enters a branch of the Black river seven miles above the water works intake. This effluent at all times is clear and seems to cause no nuisance, but whether the dangerous bacteria are removed from the sewage is by no means certain. The county infirmary is one-half mile southwest of Elyria; the average number of inmates is one hundred and ten. The sewage from this institution enters a small run which empties into the west branch of Black river just above the second dam. In summer this run is dry and none of the sewage reaches the river except what may be washed down by heavy rains. During wet seasons probably all of the sewage is carried to the river. Thus the chances for the pollution of the water supply are quite large. The liability of pollution from the large rural population, the uncertainty of the complete purification of the sewage of Oberlin, and the sewage from the infirmary all combine to make the present source very undesirable.

The water is admitted to a small brick pump well through a 12-inch pipe, which enters the river just above the first dam. The water is pumped from this well direct to the mains by two Worthington pumps. One put in in 1879, is a horizontal, duplex pump of 1,500,000 gallons capacity, and the other put in in 1897, is a horizontal compound, duplex pump of 2,000,000 gallons capacity. The water was formerly pumped to an elevated tank, but the support of this was failing and it was removed.

There are nine miles of mains in, giving some 50 per cent. of the population access to the water. There 636 services in, of which 540 are in use with none metered. The average daily consumption is 800,000 gallons and the average per consumer is 250 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$5 00
" " each additional room	1 00
" bath, each	3 00
" water closet, each	3 00
" stables, one horse and carriage..	1 50

The city water is not used for domestic purposes at all, except in a few cases where private filters are used. There is a private well for every three or four houses; these supply all the water for domestic use. Most of these wells are from 60 to 70 feet deep; the lower 50 feet is in sandstone. There are still a few surface wells eight to 10 feet deep in use. Filtered cistern water is also used to some extent.

Sewerage—Elyria has nine miles of combined sewers and a few short storm water drains. The sewers have two outlets into Black river, nine into its west branch and 15 into the east branch. Most of these sewers empty into the deeper parts of the river and cause no nuisance except in extremely dry weather, while a few empty into shallow places and cause a nuisance in ordinary summer weather. It is estimated that 65 per cent. of the population have access to the sewers, and that there are 350 water closets connected with them.

All new vaults are required to be water-tight, but the city contains many old ones, which are either planked up or have no walls at all. A large number of dry earth closets are in use. Night-soil and garbage are buried on the city dump ground, which is near Black river and some distance north of the city.

FOSTORIA, Seneca county, population 9,000. The population of Fostoria has decreased within the last year, owing to the removal of the glass factories. It is quite a railroad center, five roads going through the place. The industries consist of a large planing mill, a carbon works, incandescent lamp works and the usual small foundries and lumber mills. It has a public water supply and would have an excellent sewer system if it were kept in proper condition.

Water Supply—The water works were put in by the city in 1891 and 1892, and have cost to date $223,580.88.

The supply is taken from Portage creek one-half mile south of the city by means of a diverting canal. At the head of the canal the creek is provided with three gates six feet high and seven feet wide, which can be raised and lowered so that when the creek water is objectionable it can be excluded from the canal. This canal, 21 feet wide, two feet deep and 3,400 feet long, carries the water of the creek to the upper reservoir, which has an area of 12 acres and a capacity of 25,000,000 gallons, with a depth of some six feet. From this reservoir the water is led to a lower one by a conduit three feet in diameter and 400 feet long. This reservoir has an area of 18 acres and holds 120,000,000 gallons, with a depth of 19 feet.

The upper reservoir banks are not paved in any way, and the site was not stripped of vegetation. The large reservoir, however, is well built, the sides carefully paved, and the bottom excavated to a considerable depth.

Portage creek is dry nearly all the time, as it only has a watershed of some 32 square miles. The reservoirs are therefore filled by storm water only, the main supply coming from the spring and fall freshets. The diverting gates are left open except during flood time, but not closed down until the first flood has washed out the creek.

From the main reservoir the water flows onto a small circular filter, in the center of the bed of which is a small fountain, by means of which the water is slightly aerated. The filter has an area of 6,300 square feet, and the bed consists of a foot of sand on top of 18 inches of gravel. The water is collected by wooden underdrains and carried to the pump well, the surplus going to a small basin holding some 500,000 gallons. The pump well holds 200,000 gallons, giving with the basin nearly two days' supply of filtered water, so called. The filter acts as a strainer only, removing the coarser suspended particles. It is cleaned yearly by scraping off the top and putting in clean sand. The water is pumped to a standpipe by two horizontal, compound, duplex Gordon pumps of 1,500,000 gallons capacity each. The standpipe consists of a tank 25 feet by 100 feet placed on a stone tower 65 feet high. This gives a pressure of 70 pounds at the station and 60 pounds on the city streets.

There are 17.88 miles of mains, giving some 80 per cent. access to the city water. There are 739 taps in, but only 408 in use, of these 98 are metered. The average daily consumption is 454,000 gallons, and the average per consumer is 180 gallons. This figure includes, however, all the water used by the railroads, factories and by some 34 flush tanks on the sewer system.

In 1895 three wells were put down to supplement the surface water. These are 200 feet deep and 5⅝ inches in diameter. They are connected with an air-lift and are supposed to supply 100,000 gallons each, but they are not in use and have not been for some time.

The water rates are as follows:

Private house, one faucet	$5 00
" each additional faucet	1 50
" bath tubs, each	3 00
" water closets, each	3 00
" stables, one horse and carriage	3 00

The meter rates for 1,000 gallons are:

Twenty-five thousand to 50,000 per year	19½
Six hundred thousand to 700,000 per year	15¼
Four million to 5,000,000 per year	8
Over 5,000,000 per year	7

As the city water is muddy at times and is not drunk then, the private supply is important. Nearly every house has a private well; they are mostly drilled and are from 20 to 40 feet deep. The limestone lies about 30 feet below the surface, and most of the wells get their water from or just above it.

Sewerage—Fostoria has spent a great deal of money on her sewers, and would have a good system if they were only cared for properly. There are 23½ miles of sewers, giving some 75 per cent. of the population access to them. There are 250 water closets connected with the sewers; no vaults are allowed to be connected, though a few may be. The sewers at present empty directly into the east branch of the Portage river, but as soon as the sewage farm is in working order all of it will be filtered before it reaches the river. The sewage farm was planned to be a very efficient disposal plant, but the plans have been changed until the working of the plant will be entirely experimental and the results uncertain.

There are nine acres of land laid out in beds and underdrained ready for the sewage. This is to be run to two large tanks and then pumped from these to the beds by a centrifugal pump, operated by a gas engine. No separation of the sludge is to be allowed, everything to be pumped to the beds. This method of applying the sewage will probably resutl in clogging the beds, making it necessary for them to be continually scraped, giving poor results and high operating expenses, the very thing the plans were changed to reduce.

Portage creek was formerly very foul from the sewage, but it has been straightened and deepened, and now is not so objectionable. The local gas plant sends its waste to the creek, which causes as much of a nuisance as anything.

Nearly every house in town has a vault. These are required to be water-tight and 50 feet from a well, but the old ones do not fulfill these conditions. Garbage and night-soil are disposed of individually, usually being taken to the country.

Lisbon, Columbiana county, population 2,529. This is a quiet, old village, kept alive by the fact that it is the county seat. It has a few paved streets, water works and a few sewers.

Water Supply—Lisbon has had a water works of some kind or other for the last 50 years, and the plant has always been owned by the village. The first supply was from a small impounding reservoir in the hills back of the town, and was used for fires only. In 1887 four wells were put down near Beaver creek, but these soon failed and direct connection had to be made to the creek. West of the village is a dam on Beaver creek, from which a race runs down to a mill near the water works. A 6-inch main leads from the tail race of the mill to the supply well of the water works. This enables the creek water to be obtained above all local pollution. Eleven miles above the water works the sewage of Salem enters Salem creek, and 10 miles above the drainage of Leetonia enters Leetonia creek; and these two creeks unite eight miles above Lisbon to form Beaver creek. The sewage of Salem is enough to condemn the creek as a source of public supply. Seven miles above the water works a creamery sends its waste to the creek. Just below this a pleasure resort has a dam in the creek which forms a pond for boating. The dam is eight feet high and 50 feet long and backs the water about one-fourth of a mile. The well to which the intake pipe flows is cut out of the rock, and is 18 feet in diameter and 30 feet deep. The water is pumped from this well to a reservoir by a duplex Gordon pump of 500,000 gallons capacity and by a compound, duplex Worthington pump of 1,500,000 gallons capacity. The former was put in in 1887 and the latter in 1895

The reservoir is 50 feet square and 20 feet deep, with a capacity of 375,000 gallons. It is built of stone laid in cement, carefully protected from surface drainage, but not fenced in or covered.

There are five miles of mains in, giving about 75 per cent. of the population access to the water. There are 250 services in use, of which only one is metered, the water being too muddy for the use of meters.

The average daily consumption is about 200,000 gallons and the average per consumer is 130 gallons.

The annual water rates are as follows:

Private house, six rooms or less		$4 00
" each additional room		50
" bath tubs, each		3 33
" water closets, each	$2 80 to	4 00
" stable, one horse and carriage		3 33

Owing to the muddy condition of the hydrant water for the greater part of the year it is of little use for domestic purposes. The private water supply is from dug wells 15 to 60 feet deep, depending upon whether they are in the valley or in the hills. The water seems to be obtained from a small vein of iron ore.

Sewerage—The surface drainage and sewerage is to Beaver creek and to a small ditch leading to it. There are about five miles of combined sewers in, with seven outlets to the creek direct and two into the ditch. These sewers give about 75 per cent. of the population access to them. There are not many connections as yet made to the sewers, nearly every one using the outdoor vaults. These are usually boarded up and are required to be 50 feet from the wells. The sewage causes some nuisance when the creek is low, but has caused little complaint on account of the remoteness of the objectionable outlets.

MONROEVILLE, Huron county, population 2,000. This village has a water supply and electric lights, but no paved streets or sewers. The industries consist of an organ factory, bent wood works, and two tile works.

Water Supply—The water works were put in by the village in 1898 at a cost of $19,000. At the same time an electric light plant was put in under the same roof. This cost $11,000. The water supply is taken direct from the west branch of the Huron river at a point near the southern part of town. There are two or three small villages on the watershed of the river, but the pollution is not any greater than from an ordinary rural population.

The intake for ordinary use consists of a conduit five by five by thirty-two feet long extending under the stream. For fire purposes a 16-inch main admits the water direct. The intakes lead to a well 12 feet in diameter and 14 feet deep from which the water is pumped to a standpipe by two pumps. One is a small Rumsey power pump of 25,000 gallons capacity and the other a Hughes pump of 1,500,000 gallons capacity. The small one was put in so that the engine which runs the dynamos at night could pump water in the daytime. The standpipe is 12 feet in diameter by 120 feet high with a capacity of 105,000 gallons.

There are six miles of mains in, giving nearly the whole village access to the water. There are 143 services in use none of which are metered. The average daily consumption in summer is 500,000 gallons and in winter 20,000 gallons. The average for the year is probably about 100,000 gallons and the average for each consumer is 110 gallons. The plant is new and not in perfect running order as yet.

The only rate established is that for a private house which is $5.

The hydrant water is not drunk at all, everyone using well water for domestic purposes. The private wells average 16 feet in depth and obtain their water in a bed of gravel and sand lying just under the soil.

Sewerage—There is no system of sewers in as yet though several houses have private ones to the river. Vaults must be 50 feet from wells, but none are water-tight. Quite a number of houses use boxes which are emptied frequently.

Norwalk, Huron county, population 8,867. Norwalk is the county seat of Huron county. It is quite a railroad town, both the W. & L. E. and the L. S. & M. S. having large repair shops here. There are a number of minor industries also. The town has paved streets, an electric car line to Sandusky, a fair sewer system and a water works.

Water Supply—The first water works was put in by the village in 1871. The supply was from Peru and Coal creeks, pumping direct. This plant has cost $150,000 to date. A new supply is just being introduced from impounding reservoirs on Norwalk creek, which with the new standpipe and pump house will cost $125,000.

For the old supply small dams were built in Peru and Coal creeks and the water pumped direct from the reservoirs thus formed. Then Peru creek was abandoned and the whole supply pumped from Coal creek. This supply became unsatisfactory and the new supply from Norwalk creek is just being introduced.

Two large impounding reservoirs were built on the creek just east of the corporation line. These were formed by building two earthen dams with masonry core walls each 35 feet high, the first or lower one is 2,100 feet long and the upper one 2,125 feet long. The first reservoir is 34 feet above the city and has an area of 35 acres and a capacity of 160,000,000 gallons. The upper reservoir is 61 feet above the city and has an area of 45 acres and a capacity of 220,000,000 gallons. The only pollution possible seems to be from the ordinary rural population.

When the plant is finished the water will be pumped from the lower reservoir to a standpipe by a new horizontal compound, duplex Snyder-Hughes pump of 3,000,000 gallons capacity. The standpipe is to be 30 feet in diameter and 100 feet high, with a capacity of 530,000 gallons. The base of the standpipe is 41 feet above the city streets. In the old station at the junction of Peru and Coal creeks, the water was first pumped by a Holly pump, in 1878 two compound, duplex Worthington pumps of 500,000 and 2,000,000 gallons respectively were put in. During the first part of the last year these pumps supplied the town from Coal creek, now it is supplied by gravity from the new upper reservoir with the old pumps held in reserve for fire purposes.

There are 19.9 miles of mains in, giving some 90 per cent. of the population access to the water. There are 1,072 services in, of which 942 are in use, none of which are metered. The average daily consumption is 1,411,000 gallons and the average per consumer is 240 gallons.

The annual water rates are as follows:

Private house, five rooms or less	$5 00
“ “ each additional room	50
“ bath tubs, each	2 00
“ water closets	1 50
“ stable, one horse and carriage	3 00

Where available the city water is used entirely. Surface wells supply those unaccessible to the city water.

Sewerage—Norwalk has the combined system of sewers. There are 11.6 miles in, giving some 65 per cent. of the population access to them. The outlet of the sewers in the southern part of the town is Norwalk creek, the northern ones empty into ditches which lead to Huron river. The sewers have been put in piecemeal, and connections are not recorded, so information was hard to secure. It is estimated that one-half of those having access to the sewers are connected, this would make about 30 per cent. of the population. During dry weather the sewage causes a nuisance and an intercepting sewer to carry the sewage below town is talked of. One-half of those not connected to the sewers use dry earth closets. Vaults are constructed in any manner though the law requires them to be water tight. Night-soil is buried, no special place being provided for it.

OBERLIN, Lorain county, population 5,731. Oberlin is a college town and has no other interests whatever. Its affairs are administered by intelligent men and public improvements should be first-class. It has a number of well paved streets, a good sewer system, and a good water works. It is connected by electric railways to Elyria, Lorain and Cleveland.

Water Supply—The water works were put in by the village in 1887, and have cost to date $81,000. The supply is from the east branch of Vermilion river. The water is brought by gravity to the storage reservoirs through an 8 to 10-inch tile pipe line six miles long. The line is not absolutely water-tight and some ground water seeps in. A small dam two feet high and 32 feet long backs the water up over the intake in the river.

The watershed of the river above the intake has an area of 11 square miles. This area includes nothing but the ordinary rural population and proper care and supervision would reduce the pollution to a minimum. It is said that it is the custom to wash sheep in the river during shearing time. Another source of pollution may come from the barnyards located near the pipe line as the latter is not water-tight.

The water flows to a large reservoir, then to a smaller reservoir, finally to a pump well, and is then pumped to an elevated tank. The large reservoir was built in 1896 to furnish additional storage so that the low stages of the river could be tided over and the water would have a longer time for sedimentation. The reservoir has an area of about four acres and a capacity of 15,250,000 gallons. This gives a period of six months for sedimentation. The walls of the reservoir are carefully paved and all surface drainage is excluded. The small reservior is a brick well of 1,000,000 gallons capacity. It was originally the only storage available. As the water used is surface water there has been no trouble from growths in the reservoirs.

The two pumps used were put in by the Dean Pump Company, in 1887. They are each of 1,000,000 gallons capacity, but one is compound and the other is not. The tank is 18 feet in diameter and 35 feet high with a capacity of 66,000 gallons and is placed on a stone tower 40 feet high so that the average head against which the pumps work is 80 feet.

There are 8.5 miles of mains in, which give some 80 per cent. of the population access to the water. There are 535 services in use of which 212 are metered. The average daily consumption is 83,000 gallons and the average per consumer is 35 gallons.

The annual water rates are as follows:

Private house, six rooms or less, each family	$5 00
" " each additional room	50
" bath tubs, each	3 00
" water closets, each	3 00
" stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

Less than 500 gallons per day	30
Over 1,000 gallons per day	20
Meter rent per year	1 50

Where it is available the hydrant water is used entirely. The private water supply is from dug wells from 18 to 23 feet deep which get their water on top of the shale which is found at the above depth. The water is liable to pollution from privies and is considered bad.

Sewerage—Oberlin has the separate system of sewers. The storm water is carried principally by gutters to Plum creek, a branch of the west branch of the Black river. There are 8.6 miles of sanitary sewers in, giving some 80 per cent. of the population access to them. Nearly 1 5 of this consists of an 18-inch trunk sewer which carries all the sewage to the disposal ground. There are 450 connections to the sewers, of which 400 are for water closets. Cellars are connected with separate drains placed beside the sanitary sewers.

The sewers were put in during 1892-93. The separate system was decided upon as the small flow of Plum creek would necessitate the purification of the sewage. In 1894 the sewage disposal farm was prepared. The village acquired 20 acres of land, lying on both sides of Plum creek and about a mile east of the corporation. Three and one-half acres of this land has been laid out in beds and underdrained for intermittent filtration, and one and three-fourths aeres have been underdrained slightly for broad irrigation. The land cost $1,500 and $990 have been spent on construction. From this it can be seen that everything was done in the simplest manner possible. The sewage as it comes from the trunk sewer enters a manhole where the flow can be diverted from one settling basin to the other alternately. There are two of these basins each 32 feet by 10 feet by three feet deep. They are mere pits excavated in the ground, the sides boarded up and covered with a flat board roof. The sewage enters these basins, the heavy matter settles, floating particles are caught by a submerged board, the sewage passes out over a measuring wier and enters a ditch leading to the beds. The three and one-half acres are divided into 12 beds by small earthen ridges one foot high. The sewage is carried to the beds by small ditches and spread over the same by damming the ditch and overflowing the sides, allowing the sewage to run out on the beds. These ditches were made by running a deep furrow with a plow and trimming up the sides with a spade. When it is necessary to divert the flow, a shovelful of earth effectually closes the ditch. The beds are underdrained by two and a half and four-inch agricultural tile placed 20 feet apart. The one and a half acres used for broad irrigation are underdrained only in the low places. The sewage is distributed over this area by small ditches as above.

The soil of the upper part of the farm is composed of clay mixed with gravel and the lower part consists of a sandy loam. The fields are kept in grass principally.

The sludge held in the settling basins is pumped once a week to a tank wagon and hauled to the back of the farm where it is spread over the soil and plowed under. Crude carbolic acid is used in the basins after cleaning to destroy the smell.

The farm disposes of 75,000 gallons of sewage daily and 300 gallons of sludge. The effluent enters Plum creek and is carried to the west branch of Black river. No nuisance is caused at any time and the purification is complete as far as appearance goes.

The population of Oberlin not accessible to the sewers use outdoor privies provided with a shallow pit. Vaults are not allowed. Night-soil is carried to the country.

Piqua, Miami county, population 13,184 This town is the county seat of Miami county. It is one of the older places that flourished during the canal period in the state. Piqua has paved streets, electric lights and cars, a water works and some sewers. The industries consist of three paper mills, a woolen mill and general manufacturing.

Water Supply—The water works were put in by the city in 1876. The water works proper have cost the city $90,000 to date and the hydraulic canal $269,000.

The supply is from the "hydraulic," a branch and feeder of the Miami and Erie canal. The hydraulic leaves the main canal at Lockington and joins it again below Piqua, gathering up much surface drainage on the way and furnishing a supply of water to Piqua, also the power to pump it and to run several manufacturing plants. Just above the water works the canal broadens into three reservoirs, in all some 100 acres in area. The reservoirs and the canal are badly overgrown with weeds and moss, as the sides and bottom are not paved in any manner. The water is pumped from the hydraulic direct to the mains by two power pumps. One of these is a Flanders pump of 2,000,000 gallons capacity and the other a Gordon-Maxwell pump of 1,500,000 gallons capacity.

There are 24½ miles of mains in, giving some 90 per cent. of the population access to the water. There are 1,400 services in use, none of which are metered. The average daily consumption is 1,500,000 gallons and the average per consumer is 175 gallons.

The annual rates are as follows:

Private houses, kitchen use	$2 00
" bath tubs, each	2 00
" water closets, each	2 00
" stables, two horses and carriage	1 00

The city water is not used for domestic purposes to any extent, the main dependence being placed on private wells. About two-thirds of these are shallow dug ones, from 15 to 30 feet deep, getting their water in a bed of gravel. The others are drilled and go 10 to 12 feet into the limestone which is about 25 feet below the surface.

Sewerage—The separate system of sewers is in use now. One-half of the town is drained by the storm sewers and about one-fifth is reached by the sanitary sewers. The outlets of the sewers are to the big Miami river.

There are 180 water closets and a few vaults connected to the sanitary sewers. The sewage together with the refuse of a woolen mill causes considerable nuisance, especially during low water. The nuisance is aggravated by the dam two and one-half miles below town which backs the water up to the sewers and prevents the sewage and refuse from flowing away. The dam is four feet high and 250 feet wide, forming a pond area of about 70 acres. A state dam three miles above town keeps the river pretty low at Piqua and also makes matters worse.

Vaults must be 50 feet from wells and water-tight, but neither regulation is enforced. Night-soil is hauled to the country.

The three paper mills discharge their refuse to the canal and make it very offensive at times.

WARREN, Trumbull county, population 8,573. This city is the county seat of Trumbull county. It has a large amount of general manufacturing and not so much of the iron industry that characterizes the neighboring towns. It has 3.6 miles of paved streets, a sewer system and a water supply.

Water Supp'y—The water works were put in by a private company in 1887. The franchise was granted September 10, 1886, to run for 20 years. It contains a clause giving the city the option of purchasing at the end of any five year period. It also states that the water shall be taken from the Mahoning river, above Camp and Randall's dam and shall be conducted through settling basins or reservoirs and filters to free it from all impurities. The supply is taken from the Mahoning river just above the dam mentioned above. The pollution of the river above the intake consists of the effluent of the Alliance sewage disposal works which enters the river 46 miles above, a number of small villages, the nearest of which is Leavittsburg, the Trumbull County Infirmary and a storm drain in Warren.

Leavittsburg, a village of some three hundred people, is six miles from Warren by river. The surface drainage is reported by Prof. Brown as being particularly objectionable and as a menace to the purity of the river water. The Trumbull County Infirmary has some 125 inmates and officers and is situated 1.5 miles back from the river on Youngs' branch, which enters the river 1.5 miles above Warren, making the infirmary three miles distant by water. The women's building has a complete sewer system and a part of the men have access to sewered closets. The sewage enters the branch direct and must seriously affect the Warren water. Arrangements are now being made to purify the sewage from the infirmary. A storm sewer in Warren, draining a small section in the northern part of the city enters the river only a short distance above the intake. The sewer has no closet connections, but carries much objectionable surface drainage and should be carried below the water works for an outlet.

The dam at the water works is 6.5 feet high, 250 feet long and backs the water up about three and one-half miles. The water before passing to the mains is filtered by a Warren mechanical gravity filter plant of 1,500,000 gallons capacity, installed in 1895. The water is pumped from the river by a centrifugal pump to the settling basin, receiving on the way a solution of alum as a coagulant. It passes through the settling basin onto the filters, through them to the clear water reservoir and is then pumped to the standpipe and mains. The settling basin is about 50 feet long, 22 feet wide and 11 feet deep, holding 80,000 gallons, with a division wall through the center so arranged that the water has to travel the length of the basin twice. The clear water basin is 16 by 30 by 11 feet deep and holds nearly 50,000 gallons. The settling and clear water basins are constructed of masonry and are lined with cement. The filters consist of five wooden tanks, each 10.5 feet in diameter and contain 22 inches of sand. They are the standard gravity Warren filters with suitable screens, piping and mechanical agitator for collecting the filtered water and for washing the sand beds when they become clogged.

The coagulant is measured by a small tubular water wheel actuated by the centrifugal pump, so that the amount of solution is kept in direct ratio to the quantity of water pumped. The amount of alum used per gallon is varied by changing the strength of the alum solution, which is checked by a hydrometer. The amount of alum used is varied with the condition of the water, muddy water requiring much more than clear. The plant uses from 260 to 420 pounds of alum for 24 hours. This with an average daily consumption of about 1,000,000 gallons, would give from 1.8 to 2.9 grains of alum per gallon. This amount of alum should remove a large percentage of the bacteria. The settling basin is cleaned about once a week. Each filter is washed from two to four times a day, depending upon the condition of the water.

The water is forced to the standpipe by two compound, duplex, condensing Dean pumps of 1,500,000 gallons capacity each. The standpipe is 140 feet high, 22 feet in diameter and has a capacity of 398,000 gallons. There are 17 miles of mains in, giving about 60 per cent. of the population access to the water. There are 1,000 services in, of which 903 are in use and 140 of these metered.

The average daily consumption is 1,080,000 gallons and the average per consumer is 200 gallons.

The annual water rates are as follows:

Private houses, six rooms or less	$6 00
" " each additional room	50
" bath tubs, each	2 75
" water closets, each	2 50
" stables, one horse and carriage	2 50

Meter rates per 1,000 gallons:

One hundred to 200 gallons per day	25
Five hundred to 1,000 gallons per day	20
Over 5,000 gallons per day	15

The tap water is satisfactory and is used where available. There are a number of private wells in use and filtered cistern water is drunk to some extent. The wells are dug from 16 to 25 feet deep, and obtain their water from a bed of shale just under the clay.

Sewerage—Warren has the combined system of sewers, with five outlets to the Mahoning river, all below the water works. There are about 12.2 miles in, giving some 70 per cent. of the population access to them.

Vaults, hand-flush closets and cesspools, together with quite a number of water closets, are connected to the sewers. The sewage does not pollute the local water supply, but the lower outlets do cause a nuisance in dry weather. There is one outlet to the backwater of a dam one mile below the water works. This dam is 250 feet long, six feet high and backs the water about three-fourths of a mile. Owing to the clay soil, vaults fill up with water and are but little used. The usual practice is to construct a plank box, which is emptied as necessary. Dry earth closets are used to some extent. Night-soil and garbage are hauled to the country and disposed of.

WELLSTON, Jackson county, population 8,000. Wellston is a coal mining and manufacturing town. There are 11 mines within the corporation limits and many more just outside. There are also two blast furnaces, two ice plants, a foundry and a cement factory located here. The corporate limits include a large, hilly area, so that public improvements are difficult and costly. A few streets have been paved and a water works put in, but there are no sewers whatever as yet.

Water Supply—The water works were put in by the village in 1890, and have cost to date $80,000. The supply is from Little Raccoon creek, at a point just north of town. The creek is dammed at the water works and the water flows by gravity to a pump well. This dam is five feet high, 75 feet long and backs the water up two miles, as far as Hamden. This place is a small village of 900 inhabitants, with no water works or sewers. Its surface drainage is direct to Little Raccoon creek, and this will always be a source of danger to the water supply of Wellston. The pump well to which the creek water flows is 20 feet in diameter and 27 feet deep. It is built of brick and covered with a conical board roof. The water is pumped from this to a standpipe by two horizontal, duplex Gordon pumps of 750,000 gallons capacity each. The standpipe is 24 feet in diameter and 75 feet high, with a capacity of 250,000 gallons. It is situated on a hill, so that the main street has a pressure of eighty pounds.

During the summer season the creek goes nearly dry and fails to supply enough water. To tide over these dry spells a large storage reservoir is under construction. This reservoir is estimated to hold 85,000,000 gallons, and is formed by building an earthen dam across the end of a valley. The wall is 50 feet high at highest point, 448 feet long on top, and backs the water up 1,220 feet, forming a reservoir of something less than 35 acres in area. The water works owns the whole watershed of the valley, some 50 acres, which will be fenced in and ditched, so that no polluted surface water can reach the reservoir. The reservoir site has been completely stripped of surface soil, so that the water will not suffer any change during storage. Part of the site has been stripped down to bed rock. The inner slope of the earthen wall is three to one and is paved with one layer of brick laid dry, then grouted. A 16-inch main leads from the pumping station to the bottom of the reservoir through which the latter will be filled when the creek is high. This same main will be used to supply the pumps when the creek is low.

There are about nine miles of mains in, which give 75 per cent. of the population access to the water. There are 400 services in, of which 375 are in use and six of these metered. The average daily consumption is 250,000 gallons and the average per consumer is 110 gallons.

The annual water rates are as follows:

Private houses, six rooms or less.	$6 00
" " each additional room	1 00
" bath tubs, each	3 00
" water closets, each	3 00
" stables, two horses and cow	5 00

Meter rates per 1,000 gallons:

One to 1,000 gallons per month	40
Five thousand to 10,000 gallons per month	20
Twenty thousand to 30,000 gallons per month	10

The tap water is used more than the number of services show, as many families carry the water from neighboring houses. The private water supply is from a few dug wells, 15 to 30 feet deep. These go through clay and slate and obtain the water in a bed of quicksand.

Sewerage—Wellston has no sewers. The surface drainage is to Bundy's and Meadow runs which empty into Raccoon creek. There are but two or three water closets in use; these are connected to cesspools. Every house has an outdoor vault which usually consists of an oil barrel, but a few are built of brick. They must be 50 feet from a well. Night-soil and garbage are buried in trenches two miles south of the corporation.

YOUNGSTOWN, Mahoning county, population 50,000. Youngstown is the seventh city in the State and the center of the iron industry in the Mahoning valley. The growth of the city has been rapid, and public improvements have had difficulty in keeping pace with it. A new water supply is now under consideration and the worst fault will probably be soon overcome.

Water Supply—The water works were put in by the city in 1872 and have cost to date $650,000. The supply is from the Mahoning river at a point opposite the center of the city. The pollution of the stream at this point is serious. Besides the sewage and surface drainage of Girard, population 3,000, Niles, population 4,644, and Warren, population 8,573; five, 10 and 16 miles respectively above the water works, the river is polluted by the drainage of the upper part of Youngstown and from a large number of iron mills which line both sides of the river as far up as Niles, and above.

The water from the river is admitted to a screen chamber and then to two pump wells through five 16-inch pipes. It is then pumped through the mains to two standpipes located on the hills on the opposite sides of the river. They are each 30 feet in diameter, 100 feet high, and of 530,000 gallons capacity. The standpipes are cleaned once a year. There are three pumps in use, each of 5,000,000 gallons capacity. One is a horizontal, compound, duplex Dean pump, erected in 1884, and the other two are horizontal, compound, duplex Tod engines put in in 1897. There are 58 miles of mains in, giving some 60 per cent. of the population access to the water. There are 3,100 services in, of which 2,850 are in use, and 250 of these metered. The daily average consumption is 2,500,000 gallons, and the average per consumer is 165 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$5 50
" " each additional room up to nine	1 10
" bath tubs, each	3 30
" water closets, each	3 30
" stables, one horse	3 30

Meter rates per 1,000 gallons:

For the first 250,000 gallons per year	20
Over 1,000,000 gallons per year	8

The city water is unquestionably bad, and is used for domestic purposes to a limited extent only. The private wells are thus called upon to furnish a great deal of water for this use. These wells are of all kinds and depths, but most of them obtain their water from a porous sandstone which underlies the whole city. This stone readily permits the surface water to soak in, and the water found in it is not of the best.

Sewerage—Youngstown has the combined system of sewers with four outlets to the Mahoning river. Most of the dry flow is carried down below town by an intercepting sewer. There are 28 miles of sewers giving only the business and residence portion of the city access. The large districts occupied by the foreign laboring classes have no sewers whatever. There are about 2,000 water closets connected to the sewers, and a few vaults. In summer when the river is low the sewage becomes offensive and causes a nuisance. Vaults are required to be water-tight and this regulation is enforced in an attempt to protect the ground water. The vaults are constructed of brick and stone laid in cement, and most of them are water-tight.

A few dry earth closets are used. Night-soil is disposed of on the neighboring farms. Garbage is cremated.

ZANESVILLE, Muskingum county, population 24,008. This is a very prosperous and enterprising city, having besides the seven railroad lines, a navigable river to the Ohio. The principal manufacturing products are tile, brick, glass, iron, leather, soap, furniture, canned goods, etc. The city is supported also by quite an extensive coal mining district.

Water Supply—Zanesville has had a public water supply from the Muskingum river since 1840, when the old station below the city was built. As the city grew up the river, it began to pollute its own supply, necessitating the removal in 1873 of the pumping station to its present site above the city. The water is pumped from the river to a reservoir and a standpipe and another reservoir is filled from the first by gravity, thus giving three levels in the city. This is necessary on account of the extreme range in the level of the city due to the surrounding hills. The first reservoir built is now abandoned. The second one, built by the side of the first on Harvey Hill, is still in use, supplying the lowest service in in the city. This reservoir has a capacity of 2,000,000 gallons, and is filled by gravity from the new reservoir on Blandy Hill, which supplies the middle service. The new reservoir has a capacity of 2,500,000 gallons. The high service is supplied by a standpipe on the same hill and is supplied with water direct from the pumping station. The standpipe, built in 1894, is 100 feet high and 25 feet in diameter, giving a capacity of 367,000 gallons. It was formerly supplied by a 1,000,000-gallon Knowles pump in a station near the new reservoir, but this is not used now. An old standpipe near it has also been abandoned. The reservoirs have brick sides and bottoms laid in cement and are carefully protected from surface drainage. Owing to the large amount of sediment carried by the Muskingum river, the reservoirs have to be cleaned out at least twice a year. The pumping station contains three pumps: an old style single-acting Worthington, installed in 1873, but since remodeled and compounded, now having a capacity of 3,000,000 gallons; a horizontal compound, duplex Holly pump of 5,000,000 gallons capacity, put in in 1872; and a horizontal, compound, duplex Gordon pump of 2,000,000 gallons capacity, installed in 1895. The discharge pipes from these pumps are so arranged that any or all of them can be used on the high or middle service, the low service being supplied entirely from the middle one.

There are 64 6 miles of mains in, giving some 90 per cent. of the people access to them. There are 5,000 services in use, of which only 50 are metered. This high figure comes from a peculiar method of numbering the permits, some families having two or three services in use. Nearly everyone has the water on their premises, and it is estimated that not more than 20 per cent. drink well water. The only source of pollution to the water supply within 10 miles, is the drainage from the small collection of miners' houses which line the river above the water works. The principal objection to the water is the mud, which drives the people to well water during flood seasons. The average daily consumption is 4,187,000 gallons, and the average per consumer is 200 gallons. This high figure is due to the large use of water for manufacturing purposes.

The annual water rates are as follows:

Private houses, including bath tubs, water closets, basins, etc., $3.70 to $37.50, according to the number of persons in the house and its tax valuation.

Private stables, one horse...	$1 00

The meter rate is six cents per 1,000 gallons.

The private water supply is mainly from dug wells 10 to 12 feet in depth. In the western part of the city the wells are driven and from 20 to 30 feet in depth.

Sewerage—The city is not well sewered. The combined system of sewers is used, with outlets direct to the Muskingum river. Not more than 50 per cent. of the population have access to them and not a large number of these have connections. The sewage causes no nuisance on account of the abundance of water at all times, especially as the river in front of the city is influenced by the government dam just below. This dam is 8.5 feet high, 736 feet wide and backs the water up five or six miles. Vaults are constructed without regulation, and but few are water-tight.

(c) LAKE ERIE.

Ashtabula, Ashtabula county, population 14,686. Ashtabula consists practically of two towns, the business portion, back from the lake, and the harbor portion, with its elevators, ore hauling machinery, etc. Owing to the poor class of people in the harbor settlement, it has none of the modern improvements that are to be found in the main portion of the city. Ashtabula has about three miles of paved streets, a sewer system and a water supply.

Water Supply—The water works were put in by a private company in 1886. This company operates under a franchise granted September 21, 1886, and expiring 20 years from that time. The city has the option of purchasing at the end of 10 years and at the end of five year intervals thereafter. The franchise provides that the water shall be taken from wells and tubes on the shore of Lake Erie.

The present supply is taken direct from the lake through a 24-inch pipe leading to a submerged crib 2,600 feet from the shore line. Formerly the supply was taken from tubes and wells on the lake shore, but these failed to supply water enough and they were abandoned in 1897 for the present supply. The crib is located in 26 feet of water and the inlet is eight feet above the lake bottom. The crib is 3,500 feet west of the outlet of the Ashtabula river, into which is discharged all the sewage of the city. It is claimed that the prevailing current is eastward, which would carry the sewage away from the intake, but this cannot always hold and the water is liable to pollution at times. The water flows by gravity to a pump well 30 feet in diameter and holding 15 feet of water. From there it is pumped to a reservoir for the low service and to a standpipe for the high service. The reservoir is 216 feet above the pumps, and the top of the standpipe is 100 feet higher. The reservoir is lined with brick laid on puddled clay and has a capacity of 2,225,000 gallons. The standpipe is 100 feet high, 20 feet in diameter, and has a capacity of 225,000 gallons. Both the reservoir and standpipe are cleaned out each year. There are two compound, duplex, Worthington pumps in use, both erected in 1886.

There are about 25 miles of mains, giving some 75 per cent. of the population access to the water. There are 1,300 services, of which 1,100 are in use and 400 of these metered. The average daily consumption is

1,500,000 gallons, and the average per consumer is 225 gallons. The railroads use about 385,000 gallons of water per day, which subtracted from above would leave an average daily consumption per consumer of 170 gallons. The maximum consumption is 2,000,000 gallons, occurring in February.

The annual water rents are as follows:

Private houses, 5 rooms or less	$5 00
“ “ each additional room	1 00
“ “ “ “ family	4 00
“ bath tubs, each	3 50
“ water closets, each	4 00
“ stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

One hundred to 1,000 gallons per day	30
Two thousand to 5,000 “	20
Over 10,000 gallons per day	10

Wherever available the hydrant water is used for domestic purposes. The private wells are usually dug from 10 to 25 feet deep. The water is found in sand, gravel, shale, or rock, according to the location.

Sewerage—Ashtabula has 4.62 miles combined, 9.96 miles of sanitary and 1.13 miles of storm sewers. There is one outlet of the combined sewers, one for the storm sewer and two outlets for the sanitary sewers, all to the Ashtabula river. About 50 per cent. of the city's population have access to the sewers. There are 206 connections to the sewers recorded, but the city engineer says that there are many more. There are 100 water closets connected with the sewers. The sewage causes but little nuisance owing to the large volume of water. It is probable that at times the sewage pollutes the water supply as mentioned above. Surface privies and dry earth closets are the general rule. Night-soil and garbage are removed to a dump outside of the city.

CLEVELAND, Cuyahoga county, population 350,000. Cleveland is the second city of the State. It has a large suburban population in addition to the above, which will in time be added to it. Besides the large amount of general manufacturing, the iron and shipping industries are very important.

Water Supply—In 1896 Cleveland employed an expert commission to report on an extension of the water works tunnel and an intercepting sewer system. This commission recommended that the new intake should be four miles from shore, opposite the present pumping station, and the new pumping station to be on the east side of town, making the new intake tunnel 26,000 feet long. The new tunnel is nine feet in diameter. The new location of the pumping station was decided upon so as to avoid the construction of such a long force main to the Fairmount reservoir, which would be necessary if the old site were used. The intercepting sewer is to be laid along the lake front so as to gather up all sewage and carry it ten miles below the Cuyahoga river and away from the intake. This scheme will require the pumping of the sewage from the lower levels and one main station and three substations were provided for. The plans also provide for a tunnel from the lake to the head of slack water in the Cuyahoga through which the lake water can be pumped so as to increase the flow of the river to such a volume as shall prevent all nuisance. The new intake tunnel is well under way.

The water works were put in by the city in 1857, and have cost to date $8,396,480.41. The present supply is from an intake crib northwest of the government breakwater, and 6,625 feet from the shore line. The water is brought to the pumping station through two tunnels; one built in 1874 is five feet in diameter, and the other, built in 1891, is seven feet in diameter. The water flows through these tunnels to a large aqueduct which supplies the various pump wells. From these the water is repumped to Fairmount reservoir for the low service and repumped from there to the Kinsman reservoir for the high service. The reservoirs are located at the farther end of the supply mains and are used to regulate the pumping only.

The following table gives the make, date of installation, and capacity of the pumps at the two stations:

Station.	Number.	Make.	Kind.	Date of installation.	Capacity in 24 hours.
Division street..	1	Worthington........	Horizontal, duplex, comp...	1876	10,000,000
	1	"	" " ...	1881	10,000,000
	1	"	" " ...	1884	10,000,000
	2	Knowles.....	" " ...	1888	*15,000,000
	1	Worthington........	" " ...	1893	15,000,000
	1	Allis	Vertical triple expansion ..	1899	20,000,000
	7	Total on Primary service........................		....	95,000,000
Fairmount........	2	Cornish...........	Single-walking beam..	1857	*4,000,000
	2	Total on Secondary service..		....	8,000,000

*Capacity of each pump.

The Cornish pumps were moved from the old pumping station to the present station in 1886, when the high service was started. The present reservoirs were both completed in 1886, the low service using another reservoir before the completion of Fairmount. The Fairmount reservoir has an area of about 12 acres, and with 20 feet of water has a capacity of 80,000,000 gallons. The sides are paved with stone block on puddled clay. No surface drainage has access to it. The reservoir is cleaned every five or six years, not a great deal of mud being removed. The Kinsman reservoir is of the same construction and has a capacity of 37,000,000 gallons.

Cleveland supplies, through meters, the villages of East Cleveland, Glenville and Lakewood. They are considered as large private consumers, each owning and controlling its own water mains. It is estimated that these three places have a population of 5,000 that use the water, or according to the water department rating, there are 714 services in use in these villages.

Within the city limits of Cleveland there are 515.5 miles of mains giving practically the whole population access to the water, 438.3 miles of this are in the low service and 77.2 miles are in the high service. There are 58,030 services and 49,832 in use, of which 2,416 are metered and 185 for elevators. This does not include the services for the suburban villages. The average daily consumption for the whole system is 51,839,816 gallons, the average per consumer is 160 gallons, and the average per capita for the whole city is 148 gallons. This last figure may be large as the city claims a larger population than the one estimated above.

The annual water rates are as follows:

Private houses, three rooms or less	$3 00
" " each additional room	50
" bath tubs, each	2 00
" water closets, each	2 00
" stables, one horse	1 00

The meter rate is five and one-third cents per 1,000 gallons with a minimum rate of $10 per year.

Of necessity in a city of this size the hydrant water is used almost entirely for domestic purposes. There are a few private wells in use in the outskirts, these are usually dug and above 40 feet deep, the water being found in gravel.

Sewerage—Cleveland has the combined system of sewers with outlets to Lake Erie, Cuyahoga river and to Walworth and Kingsbury runs. These two runs are gradually turning into large trunk sewers and cannot be much longer classed as streams. There are 254 miles of sewers, giving about 60 per cent. of the population access to them. The city is divided into 21 sewer districts, three of which have no sewers as yet and several more have but partial systems. The sewage causes some nuisance at times, especially that part emptying into the Cuyahoga river and it is also liable at times, under the present conditions, to pollute the water supply. The Cuyahoga river receives the refuse from a large number of manufacturing establishments and the sewage of at least one-third of the city, and this, together with the very slow current, causes the river to become very foul, the bottom being covered with black mud which constantly gives off bubbles of very offensive gas and the water itself is black and greasy.

The local health department is compelling vaults to be abandoned and connections made to the sewers so that in the center of the city nearly every place is now connected. All new vaults must be built according to standard plans, which require them to be water-tight. Night-soil is dumbed into the lake opposite Wilson avenue and ten miles out. Garbage is disposed of by the Buckeye Refuse Destruction Company.

CONNEAUT, Ashtabula county, population 7,606. This town is divided into two portions, the main business part, back from the lake, and the part at the harbor. The industries are the elevators, ore handling at the docks, a railroad shop and some general manufacturing in the main part of the city. There is one-eighth of a mile of paved streets, a good sewer system and a water works.

Water Supply—The water works were put in by a private company in 1891. The company operates under a franchise granted June 16, 1890, and to run for 20 years. The franchise provides that the city may purchase the plant at the end of 10, 15 and 20 years respectively, from the time of granting the same. It contains the following in relation to source of the water supply: "The supply shall be ample for all the wants of a place of 10 000 inhabitants, and the water shall be taken from Lake Erie or from filtering galleries, wells or reservoirs built on the shore of said lake, in either case, in such manner as shall furnish a complete and ample supply of good pure water as aforesaid; and if taken directly from the lake, the water so taken shall be filtered or clarified in settling basins in such manner as shall make the same pure, clear and wholesome, and no reservoir other than those situated near the shores of said lake, including one from which the water is pumped shall be used in the operation of said works, and the water shall be taken from a point not less than 2,000 feet westerly of the west pier at Conneaut harbor."

The present supply is from eight Cook tubular wells, driven horizontally in the sand bed of Lake Erie. These wells extend from 200 to 350 feet under the lake and are four inches in diameter. The suction of the pumps is attached directly to the wells from which the water is pumped through the town to a standpipe back of same. There is a 10-inch pipe extending 300 feet into the lake which is used for emergencies. It is understood that the valve on this pipe is half open nearly all the time as the wells do not furnish enough water. The wells are connected up so that the standpipe pressure can be used to flush out the screens. The water is pumped by two horizontal, compound, duplex Hughes pumps of 1,000 000 gallons capacity each, erected in 1890 with the works. The standpipe is 105 feet high, 20 feet in diameter and it has a capacity of 247,000 gallons. It has not been cleaned since erected.

There are about 11 miles of mains, giving about 60 per cent. of the population access to the water. There are 700 services of which 630 are in use and none of these metered. The average daily consumption is about 800,000 gallons and the average per consumer is 210 gallons.

The annual water rates are as follows:

Private houses, six rooms or less	$6 00
" " each additional room	75
" " each additional family	6 00
" bath tubs, each	3 50
" water closets, each	4 00
" stables, one horse	3 00

The city water is used by about one-half of the city for domestic purposes, the other half using private well water. The wells are dug and from 10 to 20 feet deep, the water being found in a stratum of quicksand or gravel at this depth.

Sewerage – Conneaut has the separate system of sewers, or rather a sanitary system as nearly all the storm water is carried off in surface drains. There are about six miles of sanitary sewers in the main portion of the city and one-fourth of a mile down in the harbor portion. These sewers have two outlets to Conneaut creek which empties into the lake at the harbor. The main street has a storm sewer emptying into the same stream. It is estimated that the sewers give some 60 per cent. of the population access to them There are 219 water closet connections to the sewers, representing about 1,500 people. The sewage causes no nuisance but, as in all the lake towns, there is a liability of its polluting the water supply. Vaults are but little used, surface privies being the rule. Night-soil is buried back in the country. Garbage is carried to the city dump one-half mile above the town near Conneaut creek.

LORAIN, Lorain county, population 15,000. The growth of this city has been very rapid, so fast that the public improvements have in no way been able to keep pace with it. Its industries consist of a large steel plant, ship yard, railroad shop, ore and coal handling, and a great deal of general shipping and manufacturing. Lorain has a number of paved streets, a few sewers and a water supply. The population includes a large foreign element from the steel works and docks, making sanitary improvements difficult.

Water Supply—The water works were put in by the city in 1884, and have cost to date $230,000. The supply is from a submerged crib in Lake Erie, 1,200 feet from the shore and a little west of the outlet of Black river. The sewage of both Elyria and Lorain empties into this river and this in turn frequently flows over the intake. The water became so bad that a Jewell mechanical filter plant was introduced in 1897, and has been in operation ever since, with great improvement in the quality of the water. Elyria, population, 8,252, is situated at the junction of the two forks of the Black river, seven miles from its mouth. The sewage of about 2,500 people is emptied directly into the river at this point. The population of Lorain having the use of the sewers is estimated at 4,000.

The water flows from the crib to a pump well, from which it is forced to the filters, passes down through them by gravity to a clear water basin, from which it is pumped direct to the mains. There are three pumps in use now, with a fourth one just being installed. They are as follows: A horizontal, duplex Walker pump of 1,000,000 gallons capacity, put in in 1884; a horizontal, compound, duplex Gordon pump of 2,000,000 gallons capacity, put in in 1892, a horizontal, compound, duplex Holly pump of 5,000,000 gallons capacity put in in 1896, and a new horizontal, compound, duplex Holly of 5,000,000 gallons capacity, just being installed. The new Holly pump and the Gordon pump are connected up, so that they can supply the filters or pump direct to the mains. The old Holly can pump to the mains only and the Walker can pump to the filters only.

The filter plant consists of a set of six standard Jewell gravity filters, with a total capacity of 3,000,000 gallons. The filter tubs are each 17 feet in diameter, with an effective filter area of 226 square feet and a total of 1,356 square feet. The filter bed is four feet deep and is composed of a smooth, round-grained, white sand, from Red Wing, Minnesota. Before the water passes to the filters a certain amount of coagulant, sulphate of alumina, is added to it; the water then enters a small settling basin in the lower part of each filter tub, then passes upward through a standpipe in the center of the filter, spreads out over the surface of the sand, passes down through the latter and is collected in a network of pipes, to which are attached small strainers. The water then passes to a large, clear water well, formed by the foundation walls of the filter house. The suction of the pumps which supply the city is connected direct to this basin. The rate of filtration is controlled by a float operating the outlet valve.

When the filter becomes clogged the sand is washed. The piping is so arranged that the flow can be reversed and filtered water forced up through the sand, which at the same time is agitated by a mechanical stirrer. The filters must be washed from two to three times a day, using about 8,000 gallons of filtered water for each washing. The plant was approved by the State Board of Health, with the condition that at least 2.5 grains of alum should be used with each gallon of water, and that the rate of filtration should not exceed 100,000,000 gallons per acre per day. This would give the plant a capacity of 3,110,000 gallons, a little more than the rated capacity. The above were the figures which gave the best results in the test of the plant by the Board, for the details of which see the annual report of the State Board of Health for 1897. Since the approval of the plant the condition as regards the amount of coagulant used has hardly been observed at all. For 30 days, in September, 1897, no alum at all was used. From December 16, 1897, to June 6, 1898, lime was used in connection with the alum; the quantities averaged about 0.90 grains of alum and 0.80 grains of lime per gallon. During the summer of 1898 the alum varied from 0.7 to 1.5 grains per gallon, and in the winter of 1898 the quantity was increased to 1.5 to 2.0 grains.

There are 25 miles of mains, giving about 95 per cent. of the population access to the water. There are 2,979 services, of which 2,713 are in use and 40 of those are metered. The average daily consumption is 2,583,000 gallons and the average per consumer is 185 gallons.

The annual water rates are as follows:

Private houses per family	$8 00
" bath tubs, each	3 00
" water closets, each	3 50

The city water is used almost entirely for domestic purposes, as there are but one or two private wells in Lorain. Filtered cistern water is drunk to a limited extent.

Sewerage—Lorain has 8.4 miles of combined sewers and 4.1 miles of separate sewers. The separate system is located in the new addition around the steel plant. The separate and combined sewers have each one outlet to Black river, but the latter also have three storm water overflows to the same stream. The sewage causes no nuisance but as explained above, it may at times pollute the water supply. There are about 700 connections to the sewers, most of which are for closets. Vaults are usually constructed of brick and are fairly water-tight. Many use plank boxes, making a half way dry earth closet. Night-soil and garbage are hauled to the country and disposed of.

Port Clinton, Ottawa county, population 2,624. Port Clinton, the county seat of Ottawa county, is a pleasant little village situated at the mouth of the Portage river. It is supported entirely by its fisheries and its neighboring farmers. It has a water supply, some sewers, and about 1.9 miles of paved streets.

Water Supply—The water works were put in by the village in 1896, and have cost to date $41,025.76. The supply is from Lake Erie through a 16-inch pipe leading to a crib 1,600 feet from the lake shore and about 1,000 feet west of the mouth of the river. The crib consists of two timber shells, the outer 30 feet square and the inner 12 feet square, with the intervening space filled with gravel, through which the water must percolate before reaching the intake pipe, the end of which is placed five feet above the bottom of the lake. The water is pumped direct to the mains by two horizontal, compound, duplex Laidlow-Dunn-Gordon pumps of 1,000,000 gallons capacity each. There are seven and one-half miles of mains, giving practically the whole population access to the water. There are 225 services, of which 220 are in use, with none metered.

The average daily consumption was estimated at 500,000 gallons, but this is much too large, as 200,000 would be a high figure for a town of this size and class.

The annual water rates are as follows:

Private house, one family	$4 00
" bath tubs, each	2 00
" water closets, each	2 00
" stables, one horse and carriage	2 00

The hydrant water is used almost entirely for domestic purposes, as there are but few private wells in town. The few in use are only 14 feet deep, obtaining their water just above a layer of hard-pan. A few families drink cistern water.

Sewerage—Port Clinton has three miles of combined sewers, with four outlets direct to the Portage river. There are quite a number of connections to the sewers, but only 57 are for water closets. The sewage causes no nuisance, but, as in most of the lake towns, the purity of the water supply depends upon the constancy of the easterly currents. Vaults are constructed of plank, none of them being water-tight. Night-soil and garbage are removed to the dump ground, located one and one-half miles southwest of town, near the Sandusky bay.

The report upon Sandusky will be found with the special report upon the Sandusky watershed.

(*d*) WELLS AND GALLERIES SUPPLIED BY SURFACE WATER.

GALLIPOLIS, Gallia county, population 4,588. Gallipolis, the county seat of Gallia county, is a typical river town of the older class, and has but little manufacturing. One of the large State hospitals is located there. The town has some paved streets, an electric car line and a water supply, but no sewers.

Water Supply—The water works were put in by the village in 1895, and have cost to date $90,000. The supply is from filter wells in the bed of the Ohio river. There are four wells, each 4 feet in diameter and 6 feet deep and open only at the bottom, which is 13 feet below the low water mark of the river. The wells are placed in a sandbar at the head of Gallipolis island, and the depth of their bottom below the bed of the river varies with the shifting of the sand. The wells are made of cast iron and each is joined by a 12-inch pipe to a common suction pipe, which is 16 inches in diameter and 1,600 feet long. The pumps are connected direct to this pipe. The wells are above all local pollution of the river and 15 miles below Pomeroy and Middleport. These two towns have few sewers and the river receives nothing but the surface drainage. The water is pumped from the wells to a reservoir by two vertical, compound, duplex, condensing Gordon pumps of 720,000 gallons capacity each. The reservoir is 280 feet long, 85 feet wide, 15 feet deep, and has a capacity of 2,300,000 gallons, and is 324 feet above the bottom of the pump pit. The reservoir is quarried out of the rock, the sides are bricked up and the bottom concreted. A by-pass at the station allows the water from the reservoir to flow back through the suction pipe and wells so as to clean out the sand and gravel near the wells when it becomes clogged with silt. The wells furnish a satisfactory water and so far a sufficient quantity. There are 9.7 miles of mains, which give some 95 per cent. of the population access to the water. There are 489 services, of which 460 are in use, and 100 of these are metered. The average daily consumption is 350,000 gallons, of which 110,000 are used by the epileptic hospital. This leaves 240,000 gallons for the city, or an average per consumer of 90 gallons. The hospital has 900 inmates, and the average consumption for each person is 122 gallons. The hospital is trying to secure a separate supply.

The annual water rates are as follows:

Private houses, six rooms or less	$4 00
" " each additional room	50
" bath tubs, each	3 00
" water closets, each	2 00
" stables, one horse and carriage	2 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per month	35
One thousand five hundred to 3,000 gallons per month	25
Above 20,000 gallons per month	10

Where the tap water is available it is used for domestic purposes. It is estimated, however, that fully three-fifths of the population depend, for this use, upon cistern water. There are but few private wells, and these but little used.

Sewerage—Gallipolis has no sewers. The storm water is carried to the Ohio river through surface drains and a few tiles. Every house has a vault or cesspool, constructed without rule. None of them are ever cleaned out. When they become full new ones are dug beside them Garbage is dumped over the river bank.

The hospital has a complete system of sewers, the outlet of which is Mill creek, which empties into the Ohio river just above town. The outlet of the sewer is about 300 yards from the mouth of the creek. This creek is perfectly dry for the greater part of the time so that the sewage lies in pools and decays, giving off very offensive odors. Every rain washes this sewage down into the river, just above the water works station but below the wells, which are 1,600 feet above the pumping house. The village objected to having the hospital sewer carried into the river, as there is a great deal of water hauled from the wharf. The present arrangement holds a greater part of the sewage back until a heavy rain comes, when it is all washed into the river.

Greenfield, Highland county, population, 2,831. This is a quiet little village with no manufacturing whatever. It is supported by the country around it and the few limestone quarries near at hand. Greenfield has a water supply, and electric lights, but no paved streets or sewers.

Water Supply—The water works were put in by the village in 1891 and have cost to date, about $40,000. The supply was originally from Paint creek direct, but in 1893 the creek dried up and a well was dug in the bed of the creek so as to get the ground flow. The well is constructed of brick and is 24 feet in diameter and 15 feet deep. The water stands at the creek level when not being pumped, and is lowered about three feet during pumping. Direct connection can be made to the creek in case of fire. There is a dam just above the water works which impounds the water for power purposes. It is 250 feet long, seven feet high and backs the water up about one-half mile. The extreme width of the creek here is due to a large island. Eight miles above the water works there is another dam 225 feet wide and six feet high, backing the water up about three-fourths of a mile. The local pollution of the creek consists of the large cemetery just above the water works, the dirty surface drainage of the upper part of town, and the drainage from the small village of Goodhope, some seven miles up the creek. The water is pumped from the wells to a standpipe by two, horizontal, duplex, Gordon pumps, of 750,000 gallons capacity each. The standpipe is 75 feet high and 14 feet in diameter, with a capacity of 85,000 gallons. It is located on a hill 50 feet above the city hall. There are nine and one-quarter miles of mains, giving some 85 per cent. of the population access to the water. There are 210 services in use, five of which are metered. The average daily consumption is 300,000 gallons, and the average per consumer is 200 gallons. There is no regular list of rates, the price being estimated for each house.

The private well supply is principally from dug wells, which get their water just above the limestone, some 10 to 25 feet down.

Sewerage—There are a few storm sewers leading from the center of the village to the creek. They have about twenty closet and vault connections. One of these sewers empties just below the water works and is liable to pollute the supply during low water. A dam one foot high and 150 feet long, some distance below the water works, backs the water nearly to the well and holds the sewage, causing some nuisance. A number of outhouses built over the creek makes the latter somewhat objectionable. Vaults are not regulated in any manner.

PAINESVILLE, population 5,762; FAIRPORT, population 1,000; RICHMOND, population 300; Lake county. These towns are practically one as far as location is concerned. Painesville corresponds to the business portion of the other lake towns, and Fairport and Richmond correspond to the harbor portion. Painesville has a little general manufacturing, but is supported principally by the industries at the harbor. It has an electric car line to Cleveland, which gives it a rather suburban life. Fairport and Richmond have a large floating population depending upon the work at the docks and elevators, which are the life of both places. These three towns have the benefit of a water supply, which for Fairport and Richmond constitute the only public improvements, while Painesville has a few paved streets and a fair sewer system.

Water Supply—The water supply was put in by a private company in 1882, and has cost to date about $260,000. In 1897 the city of Painesville purchased the plant for $150,000, owing to the great depreciation of the same. The first supply was from wells and springs, but these were abandoned in 1891, when the present system of galleries was perfected. The sole supply now is from galleries in the sandy shore of Lake Erie. They are located some distance west of the outlet of Grand river. These galleries consist of plank boxes 14 inches high, 20 inches wide, and 8 feet long, placed end to end in long rows. The sides of the boxes are left open except for a wire screen to keep out the sand and gravel. Around these boxes is placed a layer of gravel, coal and charcoal, about two feet thick. Over this the lake sand is allowed to drift and wash. These galleries have to be placed just under the edge of the water so that the wave action will keep the sand washed clean. At the site of the galleries the beach is building, and two galleries have had to be abandoned and new ones built as the beach extended. In all, 1,700 feet of galleries have been built, only 1,100 feet of which can now be used. The water enters the galleries, flows from there to a raceway or reservoir, and is then pumped through the mains to a standpipe. The raceway is nine feet wide and 400 feet long, the water standing about six feet deep in it, the level of the lake. It is built of plank and covered with the same to keep the sand out.

The pumps, two horizontal, compound, duplex, Knowles of 1,500,000 gallons capacity were installed in 1891, when the pumping station was moved down to the lake shore. The standpipe is 25 feet in diameter and 75 feet high, giving a capacity of 275,000 gallons. The top of the standpipe is 235 feet above the lake level and gives a domestic pressure in Painesville of about 40 pounds.

In the three towns there are sixteen miles of mains, giving about 90 per cent. of the total population access to the water. In all, there are 1,000 services in use, divided as follows: Painesville 820, Fairport 150 and Richmond 30. Four services in Painesville are metered.

The average daily consumption is 1,250,000 gallons, of which some 130,000 gallons are used daily by the three railroads. This gives an average daily consumption of 187 gallons per consumer.

The annual water rates are as follows:

Private houses, five rooms or less	$5 00
" " each additional room	1 00
" " each additional family	5 00
" bath tubs, each	4 00
" water closets, each	4 00
" stables, one horse	5 00

The city water is in general use where it is available. Private wells are mostly dug and from 15 to 20 feet deep. The water is found in sand and gravel.

Sewerage—Painesville has about ten miles of sanitary sewers with three outlets to Grand river. One of the sewers carries some storm water, but most of it is carried off in surface drains. It is estimated that about 75 per cent. of the population has access to the sewers, and that one-half of these have connections. This agrees very well with the direct estimate of four hundred as the number of sewer connections; three hundred being for water closets. The sewage causes some nuisance during extremely low water, but it does not pollute the water supply in any way. There are but few vaults in use, surface privies being the most common. Night-soil is buried in the country and garbage is dumped in a field just north of the city.

Richmond and Fairport each have a few private sewers, but no general system.

RIPLEY, Brown county, population 2,824. Ripley is a quiet little village of the older river type. It has no manufacturing, and is supported by the small shipping industry and by the neighboring farmers. It has a water supply which constitutes the only public improvement.

Water Supply—The water works were put in by the village in 1896, and have cost to date about $24,000. The supply is from two wells on the bank of the Ohio river. These wells are eight inches in diameter and 102 feet deep, 40 feet of which is in sand and gravel and 62 feet in limestone. The wells are pumped to two settling basins by a Hall Pump Company air lift. The level of the water in the wells is the same as that in the river, and is lowered but little by the pumps. The air lift was made necessary by the wide fluctuation in the level of the water due to the varying stage of the river. The settling reservoirs are each 93 feet in diameter, and eight feet deep, giving each a capacity of 500,000 gallons. The sides and bottom are built of brick laid in cement. They are cleaned out two or three times each year, a large amount of moss and other growths being removed each time. The water tastes and smells if left in the basins long. Most of the water comes from the gravel bed which is supplied by the ground water on its way to the river, and by the subsurface flow of the latter. The water is pumped from the basins to a distributing reservoir, on a hill back of town, by a horizontal, compound, duplex Hall pump of 500,000 gallons capacity. This reservoir is built in the same manner as the settling basins, and has a capacity of 1,000,000 gallons. It gives a pressure of 140 pounds on the streets. There are four miles of mains, giving about 60 per cent. of the population access to the water. There are 130 services in use, of which 36 are metered. The average daily consumption is 180,000 gallons, and the average per consumer is 225 gallons.

The annual water rates are as follows:

Private house, six rooms or less	$5 00
" " each additional room	50
" water closets, each	2 50
" bath tubs, each	2 50
" stables, one horse and carriage	3 00

By meter, from 5,000 to 25,000 gallons per month, 20 cents for first 5,000 gallons and 6 cents for each 1,000 thereafter.

The private water supply is from a few dug and drove wells, the former about 40 feet deep and the latter from 80 to 90 feet deep. Cistern water is used almost entirely for domestic supply.

Sewerage—There are a few private sewers to the river and a number of storm water drains. It is estimated that forty houses have access to the private sewers. Vaults are not regulated in any manner, beyond requiring them to be cleaned. Night-soil is buried in the country.

WILLOUGHBY, Lake county, population 1,455. This is a quiet country village with but little manufacturing. It has an electric car line to Cleveland, which gives it some value as a residence place. Willoughby has a public water supply, but no sewers or paved streets.

Water Supply—Water works were put in by the village in 1892, and have cost to date about $32,000. The supply is from an infiltration well in a gravel bed some fifty feet from the bank of the Chagrin river. The water is pumped to a reservoir 180 feet above the river level by two horizontal, compound, duplex Hughes pumps of 500,000 gallons capacity. The reservoir is built of brick laid in cement and is covered with a conical board roof. It has a capacity of 800,000 gallons. There are five miles of mains, giving some 90 per cent. of the population access to the water. There are 250 services, with 200 in use and none metered. The average daily consumption is about 100,000 gallons, and the average per consumer is 83 gallons.

The rate for private families is $5 per year.

The water is in general use where available. It is estimated, however, that about 50 per cent. of the population use well water for drinking purposes. The wells are dug and about 20 feet deep, obtaining their water in an extensive bed of gravel.

Sewerage—Willoughby has no sewerage except a few short storm water drains. It is claimed that there are no vaults in use, every one using the dry earth closet, or a modification of it. Night-soil is usually hauled to farms. Some is buried at any available place.

2. SUBSURFACE WATER.

GALLERIES AND WELLS SUPPLIED BY SUBSURFACE WATER.

The report upon the water supply of Attica will be found with the special report on the Sandusky watershed, and the report upon the Wadsworth water supply is given in a special report with this volume.

ASHLAND, Ashland county, population 4,160. Ashland, the county seat of its county, is situated near the headquarters of Jerome fork, a secondary branch of the Muskingum river system. It is a country town with some general manufacturing. It has a few paved streets, a water supply, but practically no sewers.

Water Supply—The water works were put in by the village in 1895, and have cost to date some $50,000. The supply is from two wells situated between the branches of Jerome creek and one-half mile east of the corporation. One of the wells is 30 feet in diameter and 16 feet deep; the other 36 feet in diameter and 18 feet deep. The former was dug in 1895 and the latter in 1896. They are built of brick and covered with a conical roof and fully protected from surface drainage. The water is found in a bed of gravel, in which during wet weather it rises to the surface and in dry seasons falls to within a few feet of the bottom of the wells. The water is pumped from the wells to a standpipe by two horizontal, compound, duplex Smith-Vaile pumps of 1,000,000 gallons capacity each. The standpipe is 20 feet in diameter and 75 feet high, giving a capacity of 176,000 gallons. The pressure on the main street is 75 pounds and at the station 122 pounds. There are 13 miles of mains in, giving 65 per cent. of the population access to the water. There are 355 services in and 351 in use, of which 10 are metered. The average daily consumption is 125,000 gallons and the average per consumer is 60 gallons.

The annual water rates are as follows:

Private houses, six rooms or less	$3 50
" " each additional room	50
" bath rooms, each	3 00
" water closets, each	3 00
" stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	$0 20
One thousand to 2,000 gallons per day	14
Five thousand to 10,000 gallons per day	8

The water is high in mineral matter, forming a soft deposit in boilers and heaters, which also contains a large amount of carbonaceous matter. The water is not objectionable except in summer, when it becomes warm, then private well water is used to a large extent for domestic purposes. The wells vary in depth from 13 to 60 feet, the shallow ones obtaining their water in a bed of gravel, which is exposed to surface contamination, while the deeper ones obtain the water from a bed of limestone 24 feet down, which is overlaid with a bed of shale.

Sewerage – Ashland has but three short sewers. These carry off the storm water and kitchen refuse, and it is claimed some sewage. They empty within the corporation into a small branch of Jerome creek. The oil and soap from one of the machine shops drained by the sewers causes a nuisance in the summer.

Vaults are not regulated in any way, and many are not cleaned as often as necessary.

CIRCLEVILLE, Pickaway county, population 7,524. This town, the county seat of Pickaway county, is in the center of a famous farming district, the "Pickaway Plains." It is supported largely by the surrounding country, but it also has some general manufacturing, including a large strawboard works. Circleville has a water supply and a few paved streets, but no adequate sewer system.

Water Supply—The water works were put in by a private company in 1887, and have cost to date $150,000. A franchise was granted a company in 1886, but this one failed after building the plant, but before it was put in operation. The present company then gained control and put the works in operation, after making several additions and changes. The franchise is to run for 20 years from August 9, 1886, and contains this clause in reference to the kind of water to be supplied: "The water shall be taken from wells or filtering galleries sunk as near Hargus creek or Darby creek as an investigation may hereafter determine, together with such reservoir or storage basins of not less than 10,000,000 gallons capacity; but before such wells or filtering galleries shall be located, test wells must be sunk at various points and the water therefrom or from the stream from which it is taken submitted to an analysis by some competent person selected by the city council and Samuel R. Bullock & Company, at the expense of said council and company co-jointly, after said wells or well have been definitely located. They are to be so arranged as to exclude all surface water and any overflow from either of said creeks, and to be of sufficient capacity to allow when necessary the water to settle before being pumped into the reservoir or standpipe as the case may be; said wells are to be provided with such filtering galleries and wells as may be necessary to insure the entire supply to be clear water, suitable for culinary and drinking purposes and not detrimental to health, the quality and character of said water to be kept and maintained as shown by the analysis. Should at any time the quality of the water deteriorate and become impure, other wells are to be sunk and water obtained from such other sources as an analysis show to be pure and wholesome." It also states that no water shall be taken directly or indirectly from the Scioto river. The plant may be purchased by the city at any time after the expiration of ten years.

The present source of supply is a gallery near Big Darby creek, northwest of town. The gallery is a brick conduit running parallel to the creek and about 100 feet distant. It is 200 feet long, five feet wide and five feet high, with an arched top and terminates in a covered brick well 25 feet in diameter and 30 feet deep. The gallery enters the well a few feet above the bottom.

A small dam, 18 inches high and 100 feet long, in Big Darby creek backs the water up about one-fourth of a mile, giving a pond area of some four acres. This dam was put in by the first company and a 6-inch pipe led from the creek above it to the receiving well. This pipe was to be used in cases of emergency, but it has since been washed out. Farther up a dam diverts part of the creek to a race, which empties into the canal below town. This dam is five feet high, 100 feet wide and backs the water up about one mile.

The water is pumped from the receiving well to a standpipe by two horizontal, compound, duplex Holly pumps of 1,500,000 gallons capacity each. The standpipe is 150 feet high and 22 feet in diameter, with a capacity of 425,000 gallons. There are 15 miles of mains, giving some 90 per cent. of the population access to the water. There are 859 services, of which 750 are in use and 75 of these are metered. The average daily consumption is 600,000 gallons and the average for each consumer is 130 gallons.

The annual water rates are as follows:

Private houses, six rooms or less	$6 00
" " each additional room	75
" bath tubs, each	......
" water closets	2 00
" stables, one horse and carriage	2 50

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	$0 30
One thousand to 2,000 gallons per day	23
Over 4,000 gallons per day	15

The private water supply is from dug wells, about 25 feet deep, which obtain their water from an extensive bed of gravel under the town. The tap water is used where available, but one-third of the population are dependent upon wells.

Sewerage—The sewers of Circleville, so far as they go, are on the separate plan. There is about three-fourths of a mile of sanitary sewer, with one outlet to the Scioto river and the same length of storm sewers, with one outlet to Hargus creek. The sanitary sewer has a few closet connections, but the amount of sewage is small as compared with the flow of the river, and no nuisance results. The storm water is carried in part to Hargus creek by the storm sewer and gutters, and the remainder to the Scioto river and the canal through surface drains. As the sanitary sewer has but few connections as yet, nearly every one must use outdoor vaults. These are usually constructed of brick, but not made water-tight. Night-soil is hauled to the country.

The pollution of the Scioto river below Circleville is marked. In addition to the small amount of sewage the local gas plant and a large strawboard works send their refuse direct to the river. The strawboard works is an immense plant, employing a large number of men and turning out car loads of strawboard daily. The refuse from this plant reaches the river through two sewers, each two feet in diameter. One of these sewers empties into some low bottom land near the river, which originally served as a settling basin and precipitated most of the heavy matter from the waste water before the latter passed to the river. Now this basin is almost completely filled with sediment, and the effluent from the works has kept a channel open the whole length of the bed along which it now flows to the river with but little sedimentation. This basin contains about 15 acres, the whole of which, except for the narrow channel near one side, is filled from one to 10 feet with a decaying mass of organic matter. This mass gives off bubbles of gas continually and is very offensive. Large quantities of this accumulated filth are washed into the river during hard rains, as may be seen from the high mark of the drift. The other sewer empties into a ditch, which runs alongside the river and empties into it about one-fourth of a mile below the works. The flow of these two sewers amounted at time of inspection to over five cubic feet per second or about 4,000,000 gallons per day, and the amount was sufficient to color the river a bright yellow. It is fortunate that the river below this point is not called upon to furnish a water supply, as this large amount of organic matter effectively destroys for many miles its usefulness for any such purpose.

GREENVILLE, Darke county, population 8,176. This city is the county seat of Darke county. Its industries consist of a couple of small tile yards, a saw mill and a machine shop. Greenville has electric lights, a water supply and a few sewers, but no paved streets as yet.

Water Supply—The water works were put in by the city in 1893, and have cost to date about $89,000. The supply is from nine wells, six inches in diameter and from 50 to 57 feet in depth. The wells go through gravel and clay into a bed of gravel. The water rises nearly to the surface when the wells are not being pumped, and during a test it was lowered 18 feet, at which depth pumping at the rate of 900,000 gallons per day failed to lower the water farther. The water works is west of town on Greenville creek, to which direct connection can be made in case of fire, but this connection has not been used since August, 1895. There is a mill dam on Greenville creek, 1½ miles above the water works, which controls the amount of water in the creek during dry weather. It is six feet high, 40 feet long and backs the water up about 1½ miles.

The water is pumped direct from the wells to a standpipe by two horizontal, compound, duplex, condensing Hughes pumps of 1,500,000 gallons capacity. The standpipe consists of a tank 60 feet high and 20 feet in diameter, placed on a brick tower 70 feet high. It has a capacity of 141,000 gallons. There are 13 miles of mains, giving 90 per cent. of the population access to the water. There are 497 services and 447 in use, of which 169 are metered. The average daily consumption is 200,000 gallons and the average per consumer is 75 gallons.

The annual water rates are as follows:

Private houses, seven persons or less	$4 00
" " each additional person	25
" bath tubs, each	3 00
" water closets, each	2 00
" stables, one horse and carriage	1 50

The meter rate is 10 cents per 1,000 gallons, with minimum charges for the different sized meters.

Private wells are usually dug and from 14 to 35 feet deep.

Sewerage—There are about four miles of storm sewers in Greenville, with three outlets direct to Greenville creek, one to a ditch emptying into Mud creek and one to a ditch emptying into Bridge creek. One sanitary sewer empties into Greenville creek. These sewers have about a dozen closet connections, but the small amount of sewage causes no nuisance.

Vaults are required to be water-tight, but very few of them are. Night-soil is hauled to the country. A slaughter house on Greenville creek sends all its waste to that stream. The creek has a murky, greasy appearance, showing that the stream is getting about all the sewage that it can dispose of without causing a nuisance.

Hillsboro, Highland county, population 4,000. Hillsboro, the county seat of Highland county, is a country village with but little manufacturing. It has a water works and a few paved streets, but no sewer system.

Water Supply—The water works were put in by the village in 1893, and have cost to date about $90,000. The supply is from 10 wells, six inches in diameter, and from 45 to 50 feet deep. They are sunk into the gravel bed of Clear creek, north of the village. The water rises in the wells to within five feet of the surface and can be pumped down to the suction limit. The water is pumped to a standpipe by two horizontal, compound, duplex Laidlow-Dunn-Gordon pumps of 1,000,000 gallons capacity each. The standpipe is 135 feet high and 15 feet in diameter, with a capacity of 175,000 gallons. There are 10⅓ miles of mains, which give about 75 per cent. of the population access to the water. There are 474 services in use, 43 of which are metered. The average daily consumption is 125,000 gallons and the average per consumer is 50 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$4 00
“ “ each additional room	50
“ bath tubs, each	2 50
“ water closets, each	2 50
“ stables, one horse and carriage	2 50

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	30
One thousand to 2,000 gallons per day	23
Above 4,000 gallons per day	15

The private water supply is from dug wells about 30 feet deep, obtaining their water in the loose limestone, which is found just below the surface.

Sewerage—The surface drainage is to small ditches leading to both Clear and Rock Fork creeks. There is one sewer that leads to a branch of Clear creek. Several business blocks, the court house, jail, hotel and a laundry are connected to this sewer, which empties first into a large cesspool 20 feet square and 12 feet deep, from which the water is siphoned to the creek. This sewer has caused considerable complaint, but at the time of inspection was causing no nuisance. Vaults must be 50 feet from wells or be water-tight, but these regulations are not enforced.

KENTON, Hardin county, population 7,598. Kenton, the county seat of Hardin county, is situated near the head waters of the Scioto river and right on the State divide, part of the surface drainage of the city going north to the Blanchard river. The industries consist of a number of small plants engaged in the manufacture of hardware and implements, a car shop and the usual elevators, flour mills and lumber yards. It has a number of well paved streets, some sewers and a water supply.

Water Supply—The water works were put in by a private company in 1883, and were purchased by the city in 1887. The plant has cost to date $120,000. The present supply is from a large basin excavated from 30 to 90 feet into the limestone rock, which comes nearly to the surface at this point. This well is in the southern part of the city and 300 feet south of the Scioto river. It seems to be supplied with ground water on its way to the river, or at least by water from the vicinity, as the level of the water in the well is influenced by the local rainfall. The basin is 240 feet long and 40 feet wide; one end 40 feet square is 90 feet deep and the remaining portion is only 30 feet deep. The well has no walls except the natural stone; it is surrounded by a high fence and a slight embankment, so that it suffers but little from surface pollution. In the bottom of the basin six wells have been drilled; these are 150 feet deep from the surface and six inches in diameter. As these wells furnish but little water now, it was thought best to place Kenton in the class supplied from subsurface sources.

The water is pumped from the wells direct to the mains by the following pumps: Two horizontal Holly pumps of 500,000 gallons capacity each, so arranged that they can be connected and run as a 1,000,000 duplex pump; and a quadruplex Holly pump of 1,500,000 gallons capacity Both of the above were put in in 1883, and a small duplex McGowan pump of 250,000 gallons capacity, installed in 1894. The pumps are all placed 30 feet below the surface and the suction 26 feet farther down. In summer the water is lowered to within a few feet of the suction and in winter it rises as high as 22 feet above it.

There are about 12 miles of mains in, giving some 50 per cent. of the population access to the water. There are something over 600 services in use, there being some in use, but not recorded; 13 services are metered. The average daily consumption is about 650,000 gallons and the average per consumer is 162 gallons.

The annual water rates are as follows:

Private houses, per family	$4 00
" bath tubs, each	4 00
" water closets, each	4 00
" stables, one horse and carriage	4 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	25
One thousand to 2,000 gallons per day	15
Over 3,000 gallons per day	10

The city water is not in general use on account of the uncertainty of the supply. It is estimated that 80 per cent. of the population depend upon private wells for the domestic supply. The wells are all depths and descriptions, most of them are dug, however, from 10 to 50 feet deep; some of the drilled wells are 100 feet deep. The water is obtained in sand and gravel under the surface soil; some of the deeper ones get the water from the limestone or just above it.

Sewerage—Kenton has no adequate sewerage, the system being put in a piece at a time. There are six miles of combined sewers and three-fourths of a mile of storm sewers, all emptying into the Scioto river The sewers cover the central portion of the city only, the outskirts having but little access to them. Both vaults and water closets are connected to the sewers, but the number cannot even be estimated. The sewage causes a nuisance during low water, but does not pollute the water supply. Vaults are usually constructed of brick, but very few of them are water-tight. Night-soil is hauled to the farms. Garbage is dumped in an old railroad cut near the river.

LANCASTER, Fairfield county, population 8,302. Lancaster, the county seat of Fairfield county, is situated on the head waters of the Hocking river. Its principal industries are the shoe factories and agricultural implement works. It has many well paved streets, a fair sewer system and a water works.

Water Supply—The water works were put in by the city in 1879, and have cost to date $104,024.84. The first supply was from the old Hocking canal and was used for fire purposes only. The present supply is from a gallery, and was introduced in 1881. The gallery is constructed of brick and is 1,100 feet long, with a cross section 3½ by 3¾ feet. It lies in the lowland between the Hocking river and the old Hocking canal. The principal portion of the city is situated on the high land back from the river, so that the water obtained by the gallery is chiefly the underdrainage of the city. The old canal bed is higher than the gallery, and is at present serving as a dumping ground. Two 2-foot tile sewers are carried under the canal and over the gallery, one being carried to the river 200 yards past the gallery and the other stopping 32 feet on the other side of the gallery. The sewage from the sewer collects in a large pool from lack of drainage, causing a horrible nuisance, and without question seriously polluting the ground water with which the gallery is supplied. The gallery is about 11 feet under ground, built in a bed of gravel overlaid by blue clay. This rather impervious covering is the only thing which protects the ground water from the grossest pollution. The gallery leads to a brick well 18 feet in diameter and 20 feet deep, from which the water is pumped to a reservoir by two horizontal, duplex Worthington pumps of 1,500,000 gallons capacity each. One pump was put in in 1881, and the other in 1894. The water stands at times as high as eight feet from the bottom of the well, and can be lowered to within three feet of the bottom. The reservoir has just been completed; it is situated on top of a hill one mile east of town. It is constructed of stone laid in cement and is 100 feet wide, 220 feet long, 18 feet deep from the coping and has a capacity of 2,430,000 gallons. It is not covered, but its location prevents all surface contamination.

There are a little over 13 miles of mains in, giving some 80 per cent. of the population access to the water. There are 625 services in, of which 600 are in use and 10 of these metered. The average daily consumption is 350 000 gallons and the average per consumer is 97 gallons.

The water rates have just been changed and the new ones are not available.

A large majority of the city's population use well water for domestic purposes. The wells are both dug and drove, but all are about 30 feet deep and obtain the water in a bed of gravel which underlies the whole region. Owing to the poor sanitary arrangements, the well water is very liable to pollution.

Sewerage—Lancaster has the combined system of sewers, with outlets to the Hocking river. The sewers are of piece meal construction and are in poor condition. Not all the outlets are carried to the river and these cause considerable nuisance, and, as mentioned above, pollute the water supply. Vaults and cesspools are connected to the sewers, but the number could not be learned. Vaults are very poorly constructed, some of plank and others of brick; none are water-tight. In some cases old wells have been used as cesspools. Night-soil and garbage are dumped one-half mile below town.

NELSONVILLE, Athens county, population 6,475. This is a manufacturing and mining town. The principal industries are the brick and tile yards and coal mining. It has some paved streets, electric lights, sanitary sewers and a water works.

Water Supply—The water works were put in by the city in 1894, and have cost to date $40,000. The supply is from a well 30 feet in diameter and 23 feet deep. The water is obtained from a bed of sand and gravel, which is supplied to some extent with water from the Hocking river, a couple of hundred yards distant. The well is not wholly free from pollution, as there are a number of houses close to it, which are liable to contaminate the ground water with the leakings from their dirty yards and vaults. The well is constructed of brick and covered with a conical board roof. At times the water rises nearly to the surface, depending upon the rainfall and the height of the river, and it can be lowered to the strainer, which is four feet above the bottom. The ground water is kept up to some extent by a dam in the Hocking river, just below the water works. The dam is eight feet high, 300 feet long and backs the water up about three-fourths of a mile.

The water is pumped from the well to a reservoir by two horizontal, compound, duplex Gordon pumps of 750 000 gallons capacity each. The reservoir is 240 feet above the pumps and the same distance above the city, which it supplies by gravity. This reservoir is 80 feet in diameter and 22 feet deep, with a capacity of 750,000 gallons. It is constructed of brick laid in cement and is covered with a tin roof. It is cleaned once a year, a small quantity of sediment being removed each time There are eight miles of mains in, giving some 95 per cent. of the population access to the water. There are 230 services in use, of which three are metered. The average daily consumption is 130,000 gallons and the average per consumer is 95 gallons.

The annual water rates are as follows:

Private houses, each family	$4 00
" " each additional family	3 00
" bath tubs, each	3 00
" water closets, each	3 00
" stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

Less than 500 gallons per day	30
One thousand to 2,000 gallons per day	20
Over 10,000 gallons per day	8

Where the tap water is available it is used for domestic purposes. The private water supply is from dug wells, usually 30 feet deep, which go through clay and find the water in a sand bed beneath.

Sewerage—Nelsonville has a good system of sanitary sewers, but no storm drains. The surface water is carried through gutters and ditches to the old canal bed and to a small run which empties into the Hocking river. There are five miles of sanitary sewers, which give about 75 per cent. of the population access to them. They have one outlet to the river one mile below town. On account of the remoteness of the outlet no complaint is made of the sewage, but it must be objectionable during periods of extremely low water. There are 300 connections to the sewers, one-half of which are for water closets and the rest for drains and sinks. Vault connections are not allowed to be made to the sewers. The construction and location of vaults is not regulated to any extent. They must be cleaned at least once a year, but in some cases they are covered over and new ones dug. Night-soil is buried in the country.

SPRINGFIELD, Clark county, population 47,000. This city, the county seat of Clark county, has all the modern improvements except a good sewer system, something which is lacking in most Ohio towns. Three large private homes are located here. The principal industries are the large reaper and thresher works.

Water Supply—The water works were put in by the city in 1881, and have cost to date $666,402. The first supply was from a filter gallery; this soon failed and two years later a reservoir was built just above the junction of Beaver and Buck creeks at the site of the present pumping station. This reservoir is 350 feet long, 200 feet wide and 18 feet deep, giving a capacity of about 8,000,000 gallons. The bottom and sides are only graveled and badly covered with weeds and moss. The reservoir is filled by the seeping in of the ground water. In order to raise the level of the ground water and keep the reservoir full, a dam was built about 300 feet below the junction of the creeks. This dam is 50 feet long, four feet high and backs the water up past the reservoir. This reservoir and the old gallery supplied the city until 1894–95, when the new station and gallery was put in and the old station abandoned. The new gallery is 200 feet long, 32 inches wide and 48 inches high and lies 20 feet below the surface in an extensive gravel bed, which is situated under and between the two creeks at their junction. The gallery leads to a covered pump well 30 feet in diameter and 21 feet deep. This gallery supplies an excellent water and so far plenty of it. The reservoir is connected to the pump well by a 36-inch main, to be used in cases of emergency only.

The old station contains a 2,500,000-gallon Cope and Maxwell pump that can be used to pump the water from the old gallery to the new pump well in case of failure of the new supply due to continued drought. The new station contains a horizontal, compound, duplex Holly pump of 5,000,000 gallons capacity and a vertical, triple expansion Allis pump of 7,000,000 gallons capacity. The Holly pump was brought from the old station, but has been remodeled, and is in good condition now. The

Allis pump is a new one, put in in 1895. The water is pumped to a standpipe 30 feet in diameter and 112 feet high, with a capacity of 592,000 gallons.

There are 56 miles of mains in, which give some 90 per cent. of the population access to the water. There are 3,725 services in and most all in use; 350 are metered. The average daily consumption is 2,800,000 gallons and the average per consumer is 125 gallons.

The annual water rates are as follows:

Private houses, six rooms or less	$4 00
" each additional room	50
" water closets, each	2 50
" bath tubs, each	2 50
" stables, one horse and carriage	2 00

The meter rate is 10 cents per 1,000 gallons, with a minimum yearly charge of $10.

Private wells are used only when the city water cannot be obtained. Most of the wells are dug and from 14 to 40 feet in depth, getting their water in a bed of gravel; a few drilled wells get their water in the rock.

Sewerage—Springfield has no sanitary sewers. There are about eight miles of storm sewers in, with six outlets to Buck creek. Mill creek, which flows through town, acts as a storm sewer and receives some sewage. There are supposed to be no connections to the storm sewers, but the city building and a number of hotels and blocks have made them. There are a number of private sewers to both Mill and Buck creeks. The sewage is prevented from becoming a nuisance by the large amount of water held in Buck creek by three dams. One of these is above town near the old water works, one at Factory street and one below town. These dams are about three feet high, 70 feet long and back the water up about one mile each.

Vaults are not regulated in any manner, and so are in bad shape. Some have merely a hole in the ground, which is covered up when full. Night-soil is dumped almost any where. Garbage is dumped on the bank of Mad river, west of town.

3. SURFACE AND GROUND WATER SUPPLIES.

The reports upon Crestline, Fremont and Tiffin and the report upon Lima will be found with the special reports upon the Sandusky and Maumee watersheds respectively.

Akron, Summit county, population 43,825. Akron, the county seat of Summit county, is a very thriving manufacturing town. The principal products are sewer pipe, pottery, rubber goods, paper, knives, boilers, agricultural implements, prepared cereals, etc. It has many well paved streets, sewers and a water supply.

Water Supply—The water works were put in in 1880 by a private company operating under a perpetual charter. A new franchise, granted in 1893 and extending 24 years, provides for the purchase of the water works by the city. Nothing is said as to the source of the water. The present supply is from wells and Summit lake. There are 32 wells, six to eight inches in diameter, and from 40 to 100 feet deep, all located in the valley of the "Cemetery" run, just southwest of the city. The wells go through hard-pan and gravel into a sand in which the water is found. The wells originally flowed, but are pumped by direct suction now, the water being lowered at times to the suction limit. It is estimated that the wells supply about two-thirds of the total amount of water necessary. A 30-inch main from Summit lake furnishes all the water over and above the well supply. This lake is a portion of the canal system of the State. Its local pollution is due to a couple of summer resorts on its shores, a salt refinery and the surface drainage from the rural population. Its watershed is not large, as it is located very near the State divide. The water flows by gravity from the lake to a pump well, 50 feet in diameter and 35 feet deep, which also supplies some of the ground water itself. Before reaching this well the lake water passes through a small grit chamber, in which all the heavier matter is caught. The water is pumped to an open reservoir on a hill west of town by two horizontal, compound, duplex Worthington pumps, one of 1,500,000 gallons capacity, installed in 1880, and the other of 3,000,000 gallons capacity, installed in 1889. The reservoir is constructed of stone laid in cement, and is 200 by 125 by 15 feet deep, with a capacity of 1,968,000 gallons.

There are 50 miles of mains in, giving some 75 per cent. of the population access to the water. There are 3,650 services in, of which 3,350 are in use and 150 of these metered. The average daily consumption is 3,000,000 gallons and the average per consumer is 150 gallons.

The annual water rates are as follows:

Private houses, three rooms or less	$3 75
" " each additional room	62½
" bath tubs, each	2 50
" water closets, each	2 50
" stables, per stall	1 25

Meter rates per 1,000 gallons:

Three hundred and eighty-five thousand gallons or less per year	16
Three million gallons or over per year	8

It is estimated that 50 per cent. of the city's population use well water for domestic purposes. The wells in the low portion of the town are all dug and only 20 feet deep, while those on the hills are drilled and 60 feet deep. The shallow wells obtain their water from gravel beds and the deep ones from sandstone. A private company furnishes spring water to a portion of the city.

Sewerage—Akron has the combined system of sewers, with three outlets to the Little Cuyahoga river, two below town and a temporary one above. Much of the storm water, however, is carried off by surface drains, making the system almost a sanitary one. There are 32 miles of sewers in, giving some 40 per cent. of the population access to them. It is claimed that there are 3,000 connections to the sewers, but this figure is much too high. The sewage during extremely dry weather causes a nuisance on account of the small volume of the river. There is a dam five feet high and 50 feet wide in the river between the sewer outlets, but as the upper outlet brings in but little sewage, it causes no trouble. Vaults must be water-tight or dry earth closets used. Night-soil is disposed of on the neighboring farms.

BELLEVUE, Sandusky and Huron counties, population 4,149. Bellevue lies both in Sandusky and Huron counties. It is a manufacturing town of growing importance. Three railroads pass through it. The principal industries are the large plow and cultivator works. It has many well paved streets, electric lights and a water supply.

Water Supply—The water works were put in by the corporation in 1874, and have cost to date $100,000. The supply is from a well and a county ditch. The supply at first was from the ditch alone. This was impounded in a small reservoir five acres in area and having a capacity of 35,000,000 gallons. In 1881 an additional reservoir was built; this one has an area of eight acres and a capacity of about 55,000,000 gallons. These reservoirs have earthen embankments, but seem to be in good condition. The ditch which runs through them is fed by the farm tile and small ditches. It has a watershed of 2,000 acres, consisting of well farmed land, and the pollution consists of the drainage from the large rural population and from highly manured fields.

The well is 204 feet deep and 10 inches in diameter; it was drilled in 1895. It goes through limestone all the way, the water coming from numerous crevices found at all depths. The water stands 90 feet below the surface in summer and 65 feet below in winter. The level is influenced but little by the pumping. The well is pumped by a Downy deep-well pump of 375,000 gallons capacity. The suction is 146 feet below the surface, to which depth the water can be pumped. As the well water is hard, its use is objected to by the large number of boiler users. The manufacturing interests are strong here, so the well water is used only in the summer when the reservoirs are low, though it is much the better water from a sanitary standpoint. The reservoirs flow to a pump well 15 feet in diameter and 20 feet deep, from which the water is pumped to a standpipe by two pumps, one a Gordon pump of 1,500,000 gallons capacity and the other a Knowles pump of 500,000 gallons capacity, both in poor condition. The standpipe is 20 feet in diameter, 100 feet high and has a capacity of 230,000 gallons. There are nine miles of mains in, giving 75 per cent. of the population access to the water. There are 480 services in use, none of which are metered. The average daily consumption is 500,000 gallons and the average per consumer is 175 gallons. A great deal of this water can be accounted for by the fact that three railroads are supplied from the city mains.

The annual water rates are as follows:

Private houses, six rooms or less	$5 00
" " each additional room	50
" bath tubs, each	2 00
" water closets, each	2 00
" stables, one horse and carriage	2 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	25
One thousand to 2,000 gallons per day	15
Two thousand to 4,000 gallons per day	10

The city water is not used to a very great extent for domestic purposes; nearly every house has a private well for drinking water. Most of these are about 35 feet deep and dug into the limestone for a few feet, where the water is found. Filtered cistern water is also used.

Sewerage—Bellevue has a unique method of disposing of sewage. Some 50 to 60 feet down there seems to be an underground stream or vein of considerable size, which is said to come to the surface at Castalia, north of there Down to this current, wells or sinks are drilled into which all sewage and a great deal of the storm water is emptied. There are a number of these holes drilled by the city for street drainage and many more drilled by private parties to dispose of sewage. As it costs a good deal to drill these sink holes, most of the private houses use vaults. None of these are water-tight. Night soil is buried in the country.

Canton, Stark county, population 51,826. Canton is the county seat of Stark county. It is quite a manufacturing city, iron and clay being the principal products. But besides these industries there are the two large watch factories, employing some 1,800 hands.

Water Supply—The water works were put in by the city, and have cost to date $400,000. The supply is obtained from the west branch of Nimishillen creek and from wells. Canton has had a water supply for many years, the first water being taken from the Nimishillen creek, which was the sole source of supply until 1888, when the first wells were put down, nine being added in 1898

Nimishillen creek is dammed 1.3 miles above the pumping station, and the water brought down by a small race or canal. This dam is 35 feet long and only one foot high, merely diverting the water to the race. The creek at this point has a watershed 48 square miles in area. The only source of pollution is from the numerous farm houses and barn yards, and from a public ford one-fourth mile above the dam. Stock of all kinds are washed and watered at this ford, seriously contaminating the public water supply. The water is badly discolored at times from the large amount of organic matter due to leaves, etc.

Twenty-six drilled wells were put down in 1888 in the park adjoining the pumping station. In 1893 these were supplemented by six wells built along the race. These latter supply now more water than all the rest. The 26 wells are each four inches in diameter, and six six inches in diameter, all averaging 270 feet in depth. These wells go through on an average of eight feet of soil, 260 feet of limestone and then into sandstone.

A 2,000,0 0-gallon Gordon pump, put in in 1889, pumps the wells to a large pump well. The water rises very near the surface when the wells are not pumped, and is leveled about 25 feet by direct suction. During a test some of the wells were lowered 60 feet. The race water also empties into the common pump well, and both waters are then pumped direct by the following pumps: A 3,000,000-gallon Worthington, erected in 1887, and a 2,500,000-gallon Worthington, put up in 1890, also a 7,000,000-gallon Holly, put in about 1892. These pumps are all horizontal, compound, duplex, and are in fair condition. The average daily consumption is 3,687,781 gallons, allowing a reasonable slip for the pumps. Of this about 1,200,000 gallons is supplied by the wells, and the rest is the raw water from Nimishillen creek. This water is improved some by subsidence in the race. The public water is accessible to 90 per cent. of the city's population. There are 4,000 services, of which only 20 are metered. The average daily consumption per capita for the population actually supplied is 135 gallons.

The water rates are as follows:

Private houses, four rooms or less	$5 00
" " each additional room to six	1 00
" " each additional room above six	50
" water closets, each, with house use	2 00
" " " " without house use	5 00
" stables, one horse and cow	1 00

Meter rates per 1,000 gallons:

Five hundred to 1,000 gallons per day	15
Two thousand to 3,500 gallons per day	10
Ten thousand to 20,000 gallons per day	6

There are not many private wells in the city; most of these are dug and average 60 feet deep, getting their water from gravel.

Sewerage—The separate system of sewers is used. There are eight storm sewer outlets, three to the West Branch of the Nimishillen, four to the East Branch and one to Shivers run, which empties into the East Branch. There are 9.36 miles of storm sewers, which, with the creeks and run, take care of all the storm water.

The sanitary or house sewers all lead to one trunk sewer, which carries the sewage to a sewage disposal works south of the city. There are 17.32 miles of these sewers, including two-thirds of a mile of trunk sewer leading to the disposal works. About 50 per cent. of the city's population have access to the sewers. There have been some 1,300 connections made, but this is an estimate only, as no record is kept.

The average amount of sewage to be disposed of is 1,600,000 gallons. This is treated in a chemical precipitation plant, consisting of four tanks, each 100 by 50 feet in area, with the necessary channels, wiers, etc., and a large house for the pumps, chemical tanks, etc. As the sewage passes through this machinery house, one grain of alum and 10 grains of lime are admitted in solution to the sewage for each gallon of the same. The sewage then flows through the tanks in succession, depositing all its impurities, coming out of the last tank a comparatively clear liquid, with a slight milky tinge. This effluent flows into the Nimishillen creek but causes no nuisance. When enough sludge has collected on the bottom of the tanks the water is drawn off and the sludge run to a sludge well, from which it is pumped to a filter press. The sludge is used for fill or disposed of to the farmers. The sewage plant has cost $31,464.62 to date. The running expenses for the last year were $3,128.45 or $5.35 per 1,000,000 gallons of sewage treated.

Vaults are being done away with; none are allowed to connect with sewers. No new ones are built in the heart of the city, but many old ones still exist. Of course the outskirts still build vaults and build them according to their own ideas and plans.

Columbus, Franklin county, population 140,000. Columbus, the capital of the State, is the third city in point of size. It contains several large State institutions, including the State University, which give it a large unproductive population. Its commercial and manufacturing interests are not small, however. The principal industries are the several large buggy factories, shoe factories, steel plant, engineering works and a large amount of general manufacturing. It once rightly claimed the best paved streets and handsomest residences of any city in the State, but the former have sadly deteriorated. It has a good sewer system, but is troubled at present with the disposal of the sewage, as the Scioto river and Alum creek can no longer furnish water enough for the dilution method, which has always been used. A new water supply, or rather an addition to the present system is under consideration.

Water Supply—The water works were put in by the city in 1871, and have cost to January 1, 1898, $2,294,341.35. The original supply was from a filter basin near the Olentangy river, at its junction with the Scioto. This furnished the supply until 1877, when, to meet the increased demands of the city, the construction of a filter gallery was commenced. This gallery consisted of an open work brick tunnel 3½ feet inside diameter and 5,715 feet long It passed under the Olentangy river six feet below its bed, thence along the Dublin pike to the Scioto river at the site of the present intake, one mile west of the pumping station. This gallery gathered its water from the extensive gravel beds underlying this section of the country. The gallery was completed in 1880, and in 1883 more water being required, a branch gallery was started and completed in the following year. This branch, 1,650 feet long, was of the same construction as the main conduit; it started from a point in the main gallery just under the Scioto river and extended under the Big Four and B. & O. railroads. In 1885 a similar gallery was run from the same point in the main conduit due north 1,931 feet. It was soon found that these galleries would not furnish enough water and new ones were proposed, but there was no urgent need at that time, owing to the completion of the new East Side station in 1891. The supply from this station was first obtained from one large brick well 26 feet in diameter and originally 58 feet deep, but since filled up by the infiltration of sand. The supply from this well soon failed to meet the growing demand, and, in 1894, 32 wells were driven in a six-acre field bordering on Alum creek. These wells are 60 feet deep and six inches in diameter, all connected up to a common suction pipe, which is attached to a 36-foot suction pipe from the main well.

The wells go through the various layers of soil, clay, etc., down to 40 feet, at which depth a layer of hard-pan is passed through below which is water-bearing gravel, more hard-pan is passed through and a second large water-bearing stratum is found just above a layer of hard-pan at 60 feet, to which the wells go. The casing is perforated at the bottom and at the 40-foot level, so as to get water from both strata. The suction of the pumps is 20 feet below the surface, and when not pumping the water rises above this point. The supply has always been sufficient and even large demands lower the water but little. Owing to the distance of some of the wells from the pumps and long suction, a vacuum pump is necessary to keep the air out of the suction pipe leading to the wells. Until 1898 the above sources attempted to supply the city, but with less success each year. During all this period more or less water had to be taken direct from the Scioto river at a point just one mile west of the pumping station. The river at this point receives no pollution from the sewage of the city, except the overflow from the insane asylum sewer as explained in Professor Brown's report. The stone quarry settlements near Marble Cliff furnish a very objectionable surface drainage. The sewage from the Girls' Industrial Home, Marysville, Marion and Kenton finally reaches the Scioto, but at such distant points that the river loses all visible signs of it. but does not, from a chemical and bacteriological standpoint, completely recover.

In 1898 a new gallery was constructed starting at the station and extending under the Olentangy river, along the Dublin pike, and then under the Scioto river, in all 3,550½ feet. This gallery was constructed of a 42-inch cast iron pipe, with the lower half perforated for the admission of water. Along this line, and flowing to it, 34 6-inch wells, averaging 70 feet deep, were drilled to augment the supply. These wells extend down through the gravel and about 10 feet into the limestone under it.

Plans are proposed for a large storage reservoir on the Scioto river, with small temporary dams below it, which can be filled during low water from the large reservoir, and thus always keep water in the river, from which the galleries under the latter are to be supplied. During the winter of 1898 after the new gallery and wells were connected up, there was but little need for the direct connection to the Scioto, and the city was furnished with the subsurface water for a greater part of the time.

At the end of 1897 there were 171.5 miles of mains in use, giving about 90 per cent. of the population access to the water. There are 12,892 services in use, of which 3,005 are metered. The average daily consumption for the West Side station was 7,689,472 and for the East Side 5,806,362, making a total of 13,495,834 gallons, or an average per consumer of 160 gallons.

The annual water rates are as follows:

Private houses, one family, four rooms or less	$2 66
" " each additional room	66
" bath tubs, hot, each	2 66
" water closets, each	2 00
" stables, one horse and carriage	2 33

The meter rate is six cents per 1,000 gallons.

There has been a good deal of objection to the city water for the last few years and many will not drink it without previously boiling or filtering. A much too large percentage of the people use private well water. These wells are of every kind and depth, some shallow dug wells 15 to 20 feet deep, others drilled wells 100 or more feet deep. Most of the well water shows more or less direct sewage contamination and should not be used.

Sewerage—Columbus has the combined system of sewers with outlets to Alum creek and to the Scioto river. The sewage from the eastern part of the city is collected by a trunk sewer, which empties into Alum creek just south of Main street. This outlet causes a terrible nuisance during summer and fall, when the creek contains but little water.

The sewage from the main portion of the city, just east of the Scioto and Olentangy rivers, is carried to an intercepting sewer running the whole length of the city, and emptied into the Scioto opposite the southern part of the city. This interceptor has 22 storm overflows to the two rivers, six of which are to the Olentangy above the water works. The "West Side" has two sewers, one emptying into the Scioto just above Mound street and the other opposite the mouth of the interceptor below. The first sewer is the outlet for the oldest system of Columbus and drains the portion of the West Side just west of the river. The other sewer is what is known as the "Dry Run sewer," about which there is litigation at present. The city has been enjoined from allowing closet connections to be made to this sewer, and the outcome of the controversy is uncertain. The two large asylums in the western part of the city have a force main to the Scioto river at Mound street, through which they pump their sewage. The sewers emptying into the Scioto cause a nuisance of the foulest kind during dry weather. The water works takes all the summer flow of the river, thus making that below town nothing but pure sewage.

In all there are 143.59 miles of public sewers, 10 miles of private sewers, giving 80 per cent. of the population access to them. It is estimated that 75 per cent. of those having access to the sewers are connected, or 60 per cent. of the total population.

Vaults, hand flush closets, water closets, everything are allowed to connect to the sewers, which account for the large percentage above. Vaults are constructed in any and in every manner, and but few are water-tight. Night-soil is disposed of in the country. Garbage is collected and hauled to a disposal plant near Alum creek, where the grease, etc., are extracted, and the refuse used for fertilizer. There is a great deal of local complaint about this plant, not much of which is well founded.

HARRISON, Hamilton county, population 1,816. Harrison lies both in Ohio and Indiana, the above population is for both towns, as the water supply is in common. The village has no paved streets or sewers.

Water Supply—The water works were put in by a private company in 1891. The same company also owns the electric light plant. The combined cost of both plants was $54,300, of which about $12,000 can be charged to the light plant. There has been $2,200 added to the water plant.

The company operates under a 20-year franchise, granted in 1891, with no provision for purchasing by the village and nothing regarding the kind of water to be supplied.

The supply is from Whitewater river and wells. Most of the water comes from the river, as the wells cannot supply enough. The only chance of pollution to the river is the small village of New Trenton, six miles above, and the usual number of farm houses. The water is pumped direct from the river through two 10-inch intake pipes. There are four driven wells eight inches in diameter and 18 feet deep in the bottom of a pump well 16 inches in diameter and 18 feet deep. The wells obtain surface water only from a large gravel bed.

There are two pumps in use, one attached to the well and one to the river-intake. These pumps are of the horizontal, duplex Gordon type and have a capacity of 5,000,000 gallons each. The water is pumped to a standpipe, which is 110 feet high and 14 feet in diameter with a capacity of 125,000 gallons.

There are four miles of mains, giving about 50 per cent. of the people in both towns access to the water. There are 150 services in use, of which

25 are metered. The average daily consumption is 35,000 gallons and the average per consumer is 40 gallons.

The annual water rates are as follows:

Private houses, one or two rooms, one family	$3 00
" " three or four rooms, one family	4 00
" " nine or ten rooms, one family	8 00
" " each additional family	2 50
" bath tubs, each	4 00
" water closets, each	4 00
" stables, one horse and carriage	3 00

Meter rates per 1,000 gallons:

One thousand gallons or less per day	24
" to 2,000 gallons per day	18
Over 10,000 gallons per day	10

The private water supply is principally from drove wells, 20 to 35 feet deep, which get their water in a bed of gravel.

Sewerage—There are no sewers, either public or private, that have closet connections. The storm water is drained to Whitewater river. As the construction of the vaults is not regulated in any manner, most of them are merely holes in the ground, while a few are either boarded or bricked up.

Marion, Marion county, population 16,484. Marion is the county seat of Marion county. It has electric lights and cars, paved streets, a water supply and a fair sewer system. Its industries consist of a steam shovel, agricultural and traction engine works.

Water Supply—The water works were put in by a private company in 1890, and have cost to date about $240,000. The franchise is for 25 years, and the city may purchase the plant 10 years from November 23, 1888, and every five years after this period. The following section of the franchise refers to the kind of water to be supplied: "The supply shall be ample for all the wants of a place of 20,000 inhabitants. It shall be a good potable water, free from all obnoxious and injurious elements, and be procured from such suitable places as will guarantee its present purity, and the source shall be protected from future encroachment or pollution." The present supply is from a basin and wells two miles west of town, near the Little Scioto river. The original supply was from the basin, the wells being put down in 1895 to help through the dry months. The basin is an irregular shaped canal in the old bed of the Scioto river and gets its water from the gravel beds of the river, springs and some surface drainage. It has an area of 1½ acres and the water is from six to eight feet deep in it, giving a capacity of about 2,000,000 gallons. The sides and bottom are the natural clay and gravel and they become very badly overgrown with weeds.

There are 10 wells in a double row 600 feet long, five of these are 200 feet deep, one 140 feet, one 120 and three 100 feet deep, all are eight inches in diameter. Only two of the wells are connected to the pumps. When the reservoir gets low the two wells are pumped to it by two small Worthington pumps, one attached to each well. These pumps are horizontal, simple pumps, one of small capacity.

The water stands in the wells 12 feet below the surface when not being pumped, and is lowered the suction limit. The water is pumped from the reservoir to a standpipe by two horizontal, compound, duplex Dean pumps of 1,500,000 gallons capacity each. The standpipe is 25 feet in diameter and 90 feet high, with a capacity of 332,000 gallons.

There are 15 miles of mains, giving 75 per cent. of the population access to the water. There are 887 services in, 737 of these being in use and 70 metered. The average daily consumption is 550,000 gallons and the average per consumer is 125 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$5 00
“ “ each additional room	1 00
“ water closets, each	4 00
“ bath tubs, each	4 00
“ stables, one horse and carriage	3 00

The meter rates per 1,000 gallons per day for the first 1,000 is 25 cents, and for each additional 10 per day is 10 cents.

There are a large number of private wells in use, many are shallow dug wells getting a surface water above the limestone, the drilled ones are 45 to 65 feet deep and get a good water in the rock.

The sewerage of Marion has been previously reported on, and will be found on page 145 of the General Report.

Massillon, Stark county, population 14,328. Massillon is on the line of the Ohio canal, which gave it its original prosperity. The principal industries are agricultural works, glass factories, a rolling mill and paper mill. The paper mill manufactures a great deal of strawboard and discharges its refuse into the canal, discoloring it for a long distance. The new State hospital for insane is located about one-half mile south of the city; it has just been dedicated and has but few patients. It will have its own water works and sewage disposal plant. Massillon has some paved streets, sewers and a water supply.

Water Supply—The water works were put in in 1881 by a private company, operating at first under a franchise granted in 1881, but now under one granted June 7, 1886. This latter contract has the following clause in it regarding the kind of water to be supplied:

"The water is to be taken from Sippo lake, which is to be thoroughly cleaned and such precautions taken as will prevent future contamination, and be conducted from the lake to an impounding reservoir similarly prepared and protected. From the reservoir the water shall be first filtered and be led through a 24-inch main to the pumping station of the company, from which it will be pumped into a standpipe or reservoir of sufficient capacity and elevation to at all times supply all parts of the city with water."

The city has the option of purchasing the plant at the end of 10 years and of every five year period thereafter.

The supply is at present taken from two sources. The water used for domestic purposes is taken from a gang of drilled wells, while the water for manufacturing purposes, street sprinkling, etc., is taken from a reservoir supplied by Sippo lake.

There are six wells, six inches in diameter, with an average depth of 200 feet, the lower part in sandstone. Four of these wells flow when not being pumped and in the other two r ses very near the surface; during pumping the water is lowered 15 feet The wells are pumped direct by a 2,000,000-gallon Blake pump, put in in 1887, and by a 1,500,000 Dean pump and a 1,000,000-gallon Worthington pump, both put in in 1893, when the wells were first used. A small reservoir, 18 feet deep and 30 feet in diameter, holding 100,000 gallons is used as a reserve supply for the wells. The water is pumped from the wells to a standpipe, which was erected in 1883, being used formerly on the old supply. It is 25 feet in diameter, 150 feet high and has a capacity of 550,000 gallons. There are 24 miles of mains in this, the high pressure system, giving some 75 per cent. of the population access to the water. There are 1,300 services in use, 50 of which are metered. The average daily consumption is 500,000 gallons, allowing slip on the pumps This gives an average daily consumption per consumer of 65 gallons, which is an important figure, as it represents the amount of water used for domestic purposes only.

The low pressure supply is by gravity from a large reservoir supplied by Sippo Lake, a large marshy district northeast of the city. This supply was secured in 1881 and supplied the city for all purposes until the wells were introduced in 1893. A 2,000,000-gallon Blake pump stands in an old pumping station, which can still be used to pump the lake water to the standpipe in cases of great emergency. The low pressure is 25 pounds and the high pressure is 75 pounds.

The annual water rates are as follows:

Private houses, five rooms or less		$5 00
"	" each additional room	75
"	bath tubs, each	2 75
"	water closets, each	3 00
"	stables, one horse and carriage	2 50

Meter rates per 1,000 gallons:

One hundred to 200 gallons per day	25
One thousand to 2,000 gallons per day	18
Over 5,000 gallons per day	15

There are but few private wells in use; these are drilled wells from 20 to 30 feet deep and go into gravel and sand above the bed rock.

Sewerage—The combined system of sewers is used. The lateral sewers empty into an intercepting sewer, which has its outlet into the Tuscarawas river, just south of the city; the storm water overflows are to the canal. The sewers are accessible to about 20 per cent. of the people and about 40 per cent. of this number are connected, or about 150 families. The sewage causes a nuisance in the dryest weather, owing to the small flow of the river, but on account of the location of the outlet, the objection is not great.

Nearly every house in town has an outdoor vault, very few of which are water-tight.

NILES, Trumbull county, population 4,694. Niles is situated on the Mahoning river, a few miles above Youngstown, with which it has electric car connection. As with its neighboring towns, the iron industry is large. There is one paved street, a short sewer and a water works.

Water Supply—The water works were built by the city in 1891 and have cost to date $65,000. The supply is from nine wells driven in the low land near the river, with direct connection to the latter for use in case of fire. The wells intercept the underdrainage of the city on its way to the river and they may obtain a polluted water as the city grows. They are eight inches in diameter and from 50 to 75 feet deep, going through sandy loam and hard-pan into gravel in which the water is found. The wells flow when not being pumped, but the water can easily be lowered to the suction limit of the pumps, to which they are attached direct. The water is pumped to a covered reservoir by two horizontal, duplex, compound Hughes pumps of 1,200,000 gallons capacity each, both put in with the works. The reservoir is cut into the natural sandstone lined with brick in cement and is covered with a shingle roof. It has a capacity of 1,250,000 gallons.

The wells fail to supply water for fire purposes and a 14-inch pipe has been run to the river which must be used on such occasions, and it is said to be used occasionally at other times. There are 10 miles of mains in giving some 70 per cent. of the population access to the water. There are 559 services in, of which 555 are in use and none metered. The average daily consumption is 421,000 gallons and the average per consumer is 120 gallons.

The annual water rates are as follows:

Private houses, six rooms or less	$6 00
Each additional room up to 10	1 00
Private bath tubs, each	3 50
" water closets, each	3 00
" stables, one horse and carriage	3 00

One-half of the city's population drink well water. The wells are mostly shallow dug ones very liable to pollution.

Sewerage—Niles has 1,000 feet of combined sewers with an outlet to the Mahoning river. This sewer is on the main street and has some 50 water closets connected with it. There is a private sewer, with 10 connections, in an addition north of town, which empties into Mosquito creek, a tributary of the Mahoning.

Vaults are not regulated in any way. Night-soil and garbage are disposed of individually on the neighboring farms. There is a dam three feet high and 200 feet wide on Mosquito creek, which backs the water up some three miles. It runs a local flour mill.

RAVENNA, Portage county, population 3,484. This is a quiet country village with but little manufacturing. It has a water works, electric lights, but no sewers. It is now paving the principal street.

Water Supply—The water works were put in by the village in 1885 and have cost to date $125,000. The original supply was from Crystal lake. This soon failed in summer and in 1888 connection was made to Mussy lake. This supply was unsatisfactory, and in 1895 four wells were put down near Crystal lake. Crystal lake has an area of 37 acres and Mussy lake an area of 75 acres and an average depth of 30 feet. The drainage of the surrounding country finds access to these lakes but the pollution is not serious. Mussy lake is said to furnish the poorer water of the two and objection was made to using it as a source of supply for Ravenna. There are three wells six inches in diameter and one four inches in diameter, and they are 192, 281 and 152 feet deep respectively. The wells go through clay and gravel striking the sandstone 140 feet from the surface. The wells are pumped by a Pohle air-lift to Crystal lake when the latter is low, usually from June 1 to January 1. When not being pumped the water stands 26 feet below the surface and can be lowered 60 feet. The water is pumped direct from Crystal lake to the mains by two horizontal, compound, duplex Knowles pumps of 1.500,000 gallons each. Mussy lake was formerly pumped to Crystal lake by a 1,000,000-gallon Knowles pump, which is still in place near the lake. There are 18 miles of mains in, which give some 90 per cent. of the population access to the water. There are 1,100 taps or faucets in use on the mains, but no record is kept of the number of services. There are 14 meters in use. The average daily consumption is 500,000 gallons.

The annual water rates are as follows:

Private houses, five rooms or less	$5 00
" bath tubs, each	2 00
" water closets, each	2 00
" stables	2 00

Meter rates are five to 15 cents per 1,000 gallons according to the quantity used.

The private water supply is from a few dug wells about 20 feet deep. This water is used a good deal in summer for drinking, as the public supply is warm.

Sewerage—The drainage of Ravenna is west to the Cuyahoga and east to the Mahoning river. There are two storm sewers in town, one emptying into each of the above rivers, or into ditches leading to them. There are one or two closets connected to these sewers, which cause some nuisance in summer. A few water closets are drained to cesspools. The majority of the people use outdoor vaults or dry earth closets.

WOOSTER, Wayne county, population 5,956. Wooster, the county seat of Wayne county, is a quiet, aristocratic city, with but little manufacturing, its life being influenced to some extent by the small university located here. There are a number of well paved streets which are kept in good condition. It also has a sewer system and a water supply.

Water Supply—The water works were put in by the city in 1875 and have cost to date $114,000. The supply at present is obtained from two sources. The first water was supplied by gravity from the Redick reservoir, which is formed by a dam across Christmas run in the northern part of the city. The run above the dam has a drainage area of eight square miles, on which are located a number of farm houses and the County Children's Home, which has some 60 inmates. This institution has no sewer system, depending upon outdoor vaults. All surface drainage,

however, enters Christmas run, then flows down to the reservoir, only three-fourths of a mile below. The reservoir will hold 8,000,000 gallons, with an average depth of 18 feet. Its sides are paved roughly, but no provision is made to keep the mud from the hills from washing in. The water is very muddy all the time and it is covered with scum and growths to some extent. Besides the surface water the reservoir is supplied by a few small springs. Christmas run is dry most of the time and the reservoir is filled during freshets, when the water is in the worst condition. A well was drilled above the reservoir some years ago and pumped to the reservoir, but this stopped all the springs, so this was abandoned. As the reservoir is only 114 feet above the streets the need of greater pressure and also of a larger supply was scon felt. In 1881 a well, 47 feet deep and 33 feet in diameter, was dug northeast of the city, and the Bloomington reservoir built. The well is now pumped to the reservoir by a three-fourths million gallon Worthington pump put in in 1888. When not being pumped the well has 13 feet of water in it and it is pumped dry in about five hours, then allowed to fill again. The reservoir is circular, four acres in extent, and holds 4,000,000 gallons of water, with a depth of 13 feet. The sides of the reservoir are paved roughly, no surface drainage can enter it Its edges are overgrown with weeds and the bottom is covered with moss. The reservoir is 160 feet above the pumping station and 248 feet above the city streets. The average daily consumption is 500,000 gallons, about half of which is supplied from each reservoir. There are 11¼ miles of mains, to which some 80 per
tion per consumer is 220 gallons. This means but little, as the city water
cent. of the city's population have access. There are 485 services of which
367 are in use and 128 of these metered. The average daily consump-
is but little used for domestic purposes.

The annual water rates are as follows:

Private houses, five rooms or less	$4 00
Each additional room	50
Private bath tubs, each	2 00
" water closets, each	2 50
" stables	3 00

Meter rates per 1,000 gallons:

One thousand gallons or less per day	10
Over 1,000 gallons	08

The domestic water supply is obtained almost entirely from private wells. Nearly every house in town has a dug well, these are 18 to 25 feet deep in the lower portion of the town and some deeper back on the hills.

There are about 35 drilled wells in use, these run from 40 to 100 feet deep. The water is found in shale, which starts just below the surface and extends some distance below the wells. Vaults are not allowed within 50 feet of a well unless water-tight, but most of them are not tight and the subsurface water is of doubtful purity.

Sewerage—The combined system of sewers is used, with one outlet to Apple creek just south of the city. About 60 per cent. of the population have access to the sewer and there are 300 vaults and water closets connected to them. No complaint is made of the sewage, but the outlet is so far removed that none would be made even if the sewage were objectionable.

The stream above the sewer is periodically flushed by the operation of a water power above the outlet. The dam is 30 feet long and six feet high and is used to run a small grist mill. The water is collected by the dam and allowed to escape in volume during the operation of the mill, washing the sewage into Killbuck creek.

4. SUBSURFACE AND DEEP-SEATED WATER SUPPLIES.

The report upon the supply of Wapakoneta is included with the special report upon the Maumee watershed.

Eaton, Preble county, population, 3,892. Eaton, the county seat of Preble county, is a country village with no public improvements except its water works.

Water Supply—The water works were put in by the village in 1891, and have cost to date about $80,000. The supply is from wells and springs near Seven Mile creek. The well water is furnished by 10 driven wells ranging from 74 to 89 feet in depth and all six inches in diameter. They go through 55 feet of hard-pan into a bed of gravel which furnishes the water. The wells flow when not being pumped, and the water can be lowered 35 feet during dry weather. The springs are one-fourth mile west of the water works at the foot of a hill just across Seven Mile creek. The water is collected by a sewer pipe gallery and is brought by gravity through a tile to the station. Near the works this pipe line empties into a silt well, 13 feet in diameter and 15 feet deep, which frees the water from the heavier sediment before it reaches the pumps. It is estimated that the wells can supply 150,000 gallons per 24 hours, and the springs 200,000 gallons. A covered reservoir of 100,000 gallons capacity is just being built, into which the water of the wells and springs may flow when the pumps are not running. The reservoir is 110 feet long, 12 feet wide, 12 feet deep and will be built of brick laid in cement. Direct connection can be made to the creek for use in case of fire. The water is pumped to a standpipe by three pumps, two are horizontal, compound Gordons of 1,000,000 gallons capacity each and one small Hughes pump of 500,000 gallons capacity. The first pumps were put in with the works, and the latter in 1898. The standpipe consists of a tank 20 feet in diameter and 80 feet high, placed on top of a stone tower 50 feet high. It has a capacity of 185,000 gallons.

There are nine miles of mains in, giving some 75 per cent. of the population access to the water. There are 390 services in use, of which 110 are metered. The average daily consumption is about 90,000 gallons per day, and the average per consumer is 40 gallons.

The annual water rates are as follows:

Private houses	$5 00
" bath tubs, each	2 50
" water closets, each	2 00
" stables, one horse and cow	3 00

Meter rates per 1,000 gallons:

One hundred to 500 gallons per day	25
One thousand to 2,000 gallons per day	15
Two thousand to 4,000 gallons per day	12½

The private water supply is from shallow wells 18 to 20 feet deep. The water is usually found in gravel, but in the western part of the city limestone is struck.

Sewerage—The storm water is drained to Seven Mile creek by gutters and ditches. There are no sewers in use. There are three water closets which drain to cesspools. Night-soil is hauled to the country. A sewer system will be necessary as several gutters are in bad shape from accumulated filth.

5. DEEP-SEATED WATER SUPPLIES.

Only one town was examined having a public water supply in this class, and this one was, only because it formerly had a surface supply.

SIDNEY, Shelby county, population 5,777. Sidney, the county seat of Shelby county, has a number of small industries. It has electric lights and a water supply, but no paved streets or sewers.

Water Supply—The water works were put in by the village in 1874. The old plant cost $50,000 and the new one put in in 1889 has cost to date $107,500. The first supply was from Mosquito creek. This was abandoned in 1889, and water was taken from the Miami river. The water was filtered through two American pressure filters of 225,000 gallons capacity each and later a New York horizontal pressure filter of 500,000 gallons capacity was put in. In 1895 wells were drilled and water enough to supply the town found. Now these form the sole source of supply, and the creek water is not used at all. though the intake is intact and the water could be drawn on in case of emergency. The filters were also put out of use as soon as the well supply was developed. The present supply is from six wells, 120 feet deep and eight inches in diameter, located near the pumping station. The wells are all artesian and flow at the rate of 1,000,000 gallons in 24 hours during favorable seasons and are only lowered 10 feet by the pumps. They go through a bed of gravel 20 feet thick, then strike the Niagara limestone, in which the water is found, which is of excellent quality except for its hardness. The water is pumped direct from the wells to a standpipe situated on a hill back of town. The two pumps in use are vertical, compound, duplex Gordon pumps of 1,500,000 gallons capacity each and put in in 1889. The standpipe is 25 feet in diameter, 86 feet high and has a capacity of 300,000 gallons. It gives a pressure of 70 pounds at the station.

There are 13 miles of mains in, giving some 90 per cent. of the population access to the water. There are 700 services in, of which 685 are in use and 52 of these metered. The average daily consumption is 600,000 gallons and the average per consumer is 150 gallons.

The annual water rates are as follows:

Private houses, nine rooms or less	$5 55
Each additional room	55
Private bath tubs, each	2 22
" water closets, each	2 22
" stables, one horse and carriage	3 33

Meter rates per 1,000 gallons:

One hundred to 1,000 gallons per day	$0 25
One thousand and over gallons per day	20

The tap water is used for domestic purposes whenever available. The private water supply is from shallow driven wells.

Sewerage—There are only two sewers in town, one from the court house and neighboring streets, and one from the local brewery, both emptying into the Miami river. There are but few connections to the sewers, they are used for storm water principally.

There is a dam below town, which backs the water up past the sewers and prevents the sewage from getting away. At times this causes a nuisance. Vaults are not regulated and but few are water-tight. Night soil is hauled out on the farms.

APPENDIX III.

Proceedings of Ninth Annual Meeting

OF THE

State Board of Health

AND

Local Boards of Health of Ohio,

HELD IN

Columbus, O., Jan. 19 and 20, 1899.

REPORT OF THE PROCEEDINGS

of the

Ninth Annual Meeting

of the

STATE AND LOCAL BOARDS OF HEALTH OF OHIO

held at

COLUMBUS, OHIO, JANUARY 19 AND 20, 1899.

The ninth annual meeting of the State and Local Boards of Health of Ohio was called to order in the Y. M. C. A. Auditorium on Thursday, January 19, 1899, at 1:30 P. M., by Dr R. D. Kahle, of Lima, President of the State Board, about 300 members being present.

The President, Mr. Kahle, spoke as follows:

GENTLEMEN: We have assembled here in this, our ninth annual convention, which we have held in our State Capital. Each year we see many of the old faces, with a liberal addition of new ones. From a small beginning we have grown each year until now we have several hundred delegates at each meeting.

It is hardly necessary for me to state the object of this meeting, which is well known to most of you. We meet here each year to bring together in a closer organized body those who are interested in this work we all love so well, public hygiene. We come here to discuss those diseases that decimate the people. These meetings are a feature in the life of our State health officials and sanitarians that are looked forward to with delight and recalled with much pleasure. We come together to devise the best possible means to prevent disease, to make childhood more secure and old age more comfortable; to lift the burden from the weak, and to free mankind from those preventable diseases that meet him at every turn. The most virulent diseases are the most easily prevented, and the time may come when we shall have gained such mastery over some of these diseases that, in the future, they will live only in history.

Some diseases are incapable of being suppressed, and they are apt to be perpetuated by our success in saving the weaker lives. Sanitary science may advance so that in the future we may live healthier lives and die from accident or old age; yet some diseases will always remain.

New diseases may develop, which may in the future react differently to microbes that are now innocuous. We hope that our list of diseases is already complete. However that may be, our position—thanks to hygiene—will be safer than it ever was before.

Of preventable diseases, we have had reported to the State Board of Health during the last year 16,674, with 894 deaths, as follows:

Diphtheria and membranous croup	1,796 cases,	331 deaths.
Scarlet fever	1,619 "	68 "
Typhoid fever	1,650 "	318 "
Whooping cough	1,245 "	103 "
Measles	9,696 "	67 "
Smallpox	668 "	6 "

Smallpox has been unusually prevalent in the State the last year, and the cases have been widely scattered over the State and not confined to one or two localities as heretofore. Fortunately, the cases have been unusually mild, and the death rate has been about 1 per cent. It is stated on good authority that in Europe, before the age of vaccination, that the death rate from smallpox averaged over 2,000 per 1,000,000 inhabitants annually. If this rate prevailed in Ohio to-day, we would have in round numbers 8,000 deaths each year, but owing to vaccination we are generally free from this disease.

So free have we been from this disease that there has been a tendency to neglect vaccination, and the result has been that when a case of smallpox is once brought into the State, it has spread rapidly. The cases have been so mild that in most every instance the cases were first diagnosed chickenpox, and frequently a number of persons were exposed to the disease before the true nature of the malady was discovered. I might say in this connection that in almost every locality has been found members of the laity, and occasionally a physician, who have maintained that the disease was not smallpox, and this regardless of the positive proof to the contrary. This has been done in some instances, at least, from a mistaken idea that they were protecting their business interests.

Where the instructions of the State Board of Health have been rigidly followed, the number of cases has been limited to those that had the disease when it was discovered, and those that were exposed before the nature of the disease was known. Owing to the prevalence of this disease in the State at this time, it has been thought best to have this subject discussed as fully as possible during this meeting, and one session this afternoon will be largely devoted to its consideration.

During the last year the subject of stream pollution has been systematically studied by the State Board of Health. The pollution of the Maumee and Sandusky rivers was considered, and examinations of samples of Maumee river water collected at Findlay, Lima, Defiance, Fort Wayne, Napoleon and Toledo were made. On the Sandusky river samples were collected at Crestline, Bucyrus, Upper Sandusky, Fremont and Sandusky. Our daily river gagings are made in connection with the United States Geological Survey, two on the Sandusky river at Fremont and Mexico, one on the Maumee river at Waterville, and one on the Olentangy and one on the Scioto river at Columbus.

The program has been arranged so as to devote a part of each session to questions proposed by the local boards of health. The sessions heretofore, have been full of interest, and many valuable and practical suggestions have been brought out. I hope you will feel free to take part in these discussions, and thus add to the interest of the program.

The first paper on the program is "The Prevention of Smallpox," by Dr. H. H. Seys, Health Officer of Springfield.

THE PREVENTION OF SMALLPOX.

BY H. H. SEYS, M. D., HEALTH OFFICER OF SPRINGFIELD.

The official program for this meeting of the State and Local Boards of Health makes the statement that the health officer from Springfield would read a paper on the "Prevention of Smallpox." The *Columbus Dispatch*, however, informs me that my subect is the "Preservation of Smallpox." Interesting as the former subject may be, it is not nearly so easy of discussion as the latter, and I am somewhat at a loss to determine which to select.

While the prevention of this dread disease, a consummation devoutly to be wished, is only to be accomplished by continuous care and untiring effort on the part of municipal and health authorities, all the results which follow the preservation of it are most easy to obtain, and are as certain to follow neglect of proper preventive measures, as night is to succeed the day. How desirable it is to preserve smallpox can best be shown by a succinct history of its ravages scarce a hundred years ago. Well has smallpox been termed "the most terrible of all the ministers of death." It dates back to the early history of our race, but from whence it came no man can say. Then all expected to have it and few escaped. No respector of person; it was found in the palace and in the hovel; in the fair green fields and in the foul dungeon. All ages yielded to its noisome touch and no season of the year was free from its deadly breath. One-third of all children born to the daughters of men died before they were a year old because of this pestilence, and one-half before the age of five. In epidemic years it is estimated to have caused 50 per cent. of all the deaths in Europe, and in non-epidemic years not less than 10 per cent.

Two-thirds of the pauper blind, in Europe of that day, looked no more on the face of their loved ones, or the blue sky, nor saw the light of day because of its blighting visitation. In Mexico, it is said, in a few years to have caused the death of three and a half million people. Iceland and Greenland were almost depopulated by it, and it has well nigh rendered extinct some of our Indian tribes.

It was the all important factor in keeping down the population of Europe. Of those who escaped death and blindness, many bore during the remaining years of their lives, upon their faces, the frightful brand of this dreadful scourge. Such is but a faint and hardly outlined picture of smallpox, pure and simple, as it was before means were discovered to stay its terrible force.

Nor would the task be a difficult one to-day, should we desire so to do, to bring back the horrors of but a few years ago. Given a few loud-mouthed cranks whose knowledge is in inverse proportion to their ignorance and conceit, who nightly pray Divine Providence to save their valuable lives, least they should die, wisdom may perish from off the face of the earth ; given I say, a few such bacteria in a community, let them stand on the street corners and tell of the horrors of vaccination, the dreadful calamities they have known to follow it, talk of their rights and of their conscientious scruples, etc., etc., etc., *ad nauseam*, add a few politicians who are honest conservators of the public money, and who do not believe in preventive measures, then add a few years of time and lo! the calamity is upon them, and death and blindness and bankruptcy follow swiftly and surely.

Such has been the experience of scores of cities and towns. The estimated loss in Philadelphia, not many years ago, was over twenty-one millions of dollars ; Reading, Pa., will be long in reviving from the blow ; Akron and Pomeroy, Ohio ; Montreal, Canada ; Gloucester, England, and many other cities and districts have had occasion to mourn in sack-cloth and ashes the assinine folly of their authorities and of their people.

It is true that such *dies iræ* will surely result from neglecting to use preventive measures. It is also true, on the other hand, that the enforcement of the means known for the prevention of this most expensive and fatal disease, will absolutely insure any town, city, district or nation against it. *What* are the means at our disposal by the use of which smallpox can with absolute certainty be prevented.

First, last, and all the time, *vaccination.* What is vaccination ? Is it smallpox modified by being transmitted through neat cattle, or is it a disease different from smallpox, and yet capable of affording immunity, as perfect, as an attack of the disease itself ? This question has not been answered, but is still *sub judice.* Nor is the answer material. For while we do not know what it is, we do know what it has done, and what it will do.

I want to give you an illustration from my own life in checking the spread of smallpox. In 1862 I was in camp with the Third Ohio Volunteer Infantry in the State of Kentucky. At midnight, one night, I was called to see a man who had the smallpox. He had been exposed to the disease and he had been all through the camp everywhere, and he had the opportunity of contaminating every man in the regiment. Dr. Means and myself—I was the assistant surgeon of the regiment—took the matter in hand. The man was removed to a secluded place and every man in the regiment was ordered into line, and every arm was inspected and vaccinated. In five days we repeated the operation, where it was not successful. In 10 days we repeated the operation again, and in fifteen days we repeated the operation again. That ended the smallpox in the Third Ohio regiment and not another man took the disease. The man died with one of the most malignant cases of smallpox that I have ever seen, and I believe that our prompt measures was the only thing that saved the regiment from an outbreak of the disease.

It is the greatest boon that science has ever given to humanity. It has probably saved during the last century more lives than have been taken in battle, during the same period, by those heroes we all so dearly love to worship. It has materially advanced the progress of civilization; increased the average duration of life; lowered the death rate, and made Europe the populous hive of industry it is to-day. It has made the pest of smallpox almost an unknown disease, and there are hundreds of physicians who have practiced their profession for scores of years who have never seen a case. So much for what it has done. What can it do? It can afford a protection against smallpox as perfect and complete as an attack of that disease can give against its own poison, and with an amount of risk of serious results, so small as to be almost incalculable. I make this statement without fear of successful contradiction.

When I talk this way of vaccination, I do not mean the cheap, uncertain, unreliable, fictitious work, that too often passes for the genuine article.

It should be done by men who are not only capable, but honest, and who should be so paid for their work that they can afford to do it thoroughly and well. Every child should be vaccinated before it is one year old, again after puberty, and all adults in times of danger or after exposure.

It should be free. Few communities hesitate to expend large amounts of money every year for protection against fire. Less than one hundredth part of the sum so spent, would, if properly expended, protect absolutely against this scourge. It should be done thoroughly and with the best attainable material. Each arm should be inspected more than once after the operation, to determine if the results that follow be the true vaccine disease. Vaccination so done, properly, thoroughly done, is a more certain and complete protection against smallpox than an attack of the disease is a protection against itself.

In plain English, I regard my own vaccination scars as a better insurance policy against smallpox than if I had had an attack of the disease, and my immunity has been tested so often and under such circumstances, that no thought of danger is entertained when exposed to contagion. And yet I revaccinate myself whenever my duties bring me in contact with the disease.

If the above broad claim as to the value of efficient vaccination is challenged, here or elsewhere, I am ready with the proofs of its truth.

What other preventive measures have we?

First. Early recognition of the disease. Should a case of suspicious rash appear, see to it that it is promptly reported to the health authorities, and most carefully examined by some one competent to give an opinion. Do not call it chickenpox or varicella globos, or measles, or scarlet fever, or something else, in spite of evidence to the contrary, and then stick to it through thick and thin, as I am sorry to say some of the physicians of Ohio have done too frequently. Should there be fair grounds for doubt as to the nature of the case, promptly place the patient and all exposed, under such confinement as will protect the community until time may be had for more thorough investigation, and a more certain diagnosis.

Second. Should the case be determined to be smallpox in any of its forms, quarantine all the inmates of the premises, and the premises themselves. This quarantine can be made effective by calling on the police force to furnish guards, or as has been suggested, by employing the adult males of the family to act as such, paying them from the municipal treasury, their ordinary wages, and having them .provide for their families as usual. Do not pay them until after their services can be dispensed with, giving them to understand that they will not be paid if they do not do their full duty, and let the neighbors, who will be only too willing, act as spies upon them and report the facts, should they be derelict in maintaining the most strict seclusion. Let the building be plainly placarded "smallpox."

Third. Let all persons who have been directly exposed be promptly vaccinated, repeating the operation within five days, if there be no evidence that it has been successful. Such persons should, when possible, be more or less strictly quarantined until the vaccination proves successful, or for a period of not less than 16 days, at the end of which time any danger of their developing smallpox will have passed.

Let me give you another incident which happened under my observation. It was a case of a man who escaped from Sandusky. He had a slight attack of the disease and after getting better he escaped from the town. He came to Springfield. I was notified of it and I went after him, and caught him in two days and locked him up. Then I looked up all his friends who had in any way been exposed, and I locked them up. I kept them quarantined for 16 days. The man was just over the peeling stage when he came into our town. I pursued this policy in this case and I had no bad results.

Fourth. I hold it to be the duty of the municipal authorities to provide suitable medical attendance for those otherwise unable to obtain it, and in case of the poor, who are not being paid their ordinary wages while acting as guards, to furnish them a fair allowance of food and fuel during the time of their confinement.

Fifth. A general vaccination of all children should be ordered, especially those attending school, and all persons who have not been vaccinated since childhood should be requested to have it done promptly.

Unfortunately in this free and independent country of ours, where every man is fully privileged to have the smallpox if he wants it, and thereby to damage himself, his family and the community in which he lives, we cannot or do not have a compulsory vaccination law. The school authorities, however, can demand that all children attending the public schools shall present a certificate of successful vaccination, and thus reach those parents who are disposed to be troublesome. Similar action can be taken by those having employes, compelling them to protect in this way their shop mates and associates, as well as the community in which they live, under penalty of dismissal.

Sixth. After recovering from an attack of the disease, the thorough disinfection of persons, clothing and premises is most important. The copious use of a solution of bichloride of mercury, corrosive sublimate, on the persons, clothing, woodwork of rooms, the burning of large quantities of brimstone, not less than three pounds to each 1,000 cubic feet of air space to be disinfected, in combination with as much steam as can be generated at the same time in the apartments thoroughly closed, is as effectual as any means that can ordinarily be used.

The generation of large quantities of formaldehyd gas is better, but in small towns or country districts no conveniences are generally on hand for this purpose.

All clothing, beds and bedding that have been used by the sick should be burned.

Seventh. Isolation hospital. It would, without doubt, be a great advantage could there be in all communities an isolation hospital for the care of those who either have no homes, who belong to the great army of tramps, or of the very poor, whose homes are so void of comfort, or the very necessaries of life, as to give them but meager chances of recovery, or poor attention.

By putting those suffering from this disease together, not only is expense lessened, but also the danger of the spread of the contagion minimized by lessening the number of *foci* from which it can be disseminated.

Eighth. How shall suspects be dealt with? A question difficult to answer, a problem not easy to solve. In my own city this winter I simply corralled all in the house, five adults, put police on duty night and day, fed my captives, and at the end of fifteen days all danger of an outbreak having passed, had them thoroughly washed with a solution of bichloride of mercury, one to 2,000, used formaldehyd gas most freely in the different rooms of the house, and then turned them loose with no damage done to the community, and an expense, all told, of about $80. The same, or practically the same, course was pursued when an unmistakable case of smallpox developed in our city hospital several years since. As quickly as possible the patient was moved to the pest house, all inmates of hospital vaccinated, where not deemed unsafe, quarantined for 16 days, and no spread of the disease resulted.

Ninth. In times when the disease is known to exist, let all cases of so-called chickenpox be most carefully examined. It is a fact that, without exception, that every epidemic of smallpox that has occurred in this State during the last ten or more years, has originated from so-called varicella, or chickenpox. While it is true that in some cases of varioloid or modified smallpox, or in cases of phenomenally mild type, a diagnosis is difficult, in some few cases well nigh impossible, yet careful, painstaking, intelligent investigation will almost invariably disclose the true nature of the complaint. Should there be doubt, give the community the benefit of the doubt. Isolate your suspect. Call in counsel, and do not be so wise in your own conceit as to think that you cannot make a mistake, or so weak as to be afraid to admit an error. A fool is the only man who never errs.

This is not the time or place for discussion as to how to differentiate between smallpox and other diseases, to do which not infrequently puzzles the most careful and competent. Painstaking, intelligent study will generally disclose the nature of the attack. Do the best you can, and should you prove to have been mistaken, remember that other wise men have often been in the same plight, for to err is human.

Permit me to say in conclusion that it is not for the best interests of a community to preserve smallpox, but on the other hand, every consideration of public welfare demands that health officers, boards of health and municipal authorities should do their full duty towards prevention, and it is further the duty of all good citizens, who have the best interests of themselves, their families, and their neighbors at heart, to support most thoroughly and in every way, every effort that can be made to give them full protection against this most loathsome disease, and to preserve not smallpox, but that most valuable of all gifts to a community—public health.

Dr. Stanton, Cincinnati—I did not intend to speak on the paper at this time. I will say, however, while I am on the floor, that the greatest difficulty we have experienced is that some of the physicians are not in sympathy with the health authorities. I am sorry to say that the greatest difficulty has been among the older members of the profession, those who speak of the "old fashioned" smallpox. It has been difficult in many cases to bring some of the local health authorities into cooperation with the State Board of Health. As a result of this, in many cases where there is cooperation, it is in a half-hearted way that must bring disappointment. We have been having smallpox in the States of Ohio, Iowa, Nebraska, Pennsylvania, and many of the Southern States. This disease has everywhere presented a mild character, as shown here in Ohio, and the result has been that many persons have been unwilling to accept the diagnosis of smallpox. The diagnosis, in many of the early cases has been very difficult, but when the cases have been observed for some time, there has been no doubt as to the diagnosis. Dr. Probst will show you that vaccination has been almost an absolute protection against the disease. There is a case of a family in which there were seven members, and only one of them had been vaccinated, that one escaped the disease; while in a family of six next door, all had smallpox, none of them having been vaccinated. This is a proof of its value as a protection against the disease. In many cases, this disease has been mistaken for chicken pox, but investigation by the State Board has shown that many of these persons had had chickenpox. I think it has been fortunate that the cases were not more severe. If they had been "old fashioned" cases of smallpox, as some of the physicians are in the habit of expressing it, it would have been easier to have enforced proper measures. I think, in making the diagnosis, it is necessary to make observation for a number of days. I want to say, also, that it is safer to regard doubtful cases with suspicion until we are sure that it is not smallpox. There is one point that I think has been misunderstood or impressed too strongly, and that is umbilication of the pustule. In one case of a physician of many years' experience, he decided that it was not smallpox because umbilication, or "umbilification," as he called it, did not take place.

Mr. C. F. Eise, Health Officer of Galion—The proposition which I am about to make should perhaps come up in the question box. I wish, however, to make a statement of a case and get the opinion of the convention. Our town of Galion is situated on the main line of the Big Four Railroad, and has close connection with the large cities of the State. On this account it is a great harboring place for tramps. Through this tramp fraternity smallpox has been propagated. Some weeks ago we decided that the best plan to adopt would be to establish a pest house or emergency hospital, to be owned jointly by the city and township. We have a pauper hospital for indigent persons where they are temporarily provided for. Under these circumstances, we believed it to be a good idea to ask the township trustees to join with us in providing a building of that character. The two boards met under harmonious circumstances, and decided to lease a building three miles outside of the city limits. This building which we leased is fifty feet from the highway and forty rods from a country school house, and about the same distance from the nearest farm house. It was thought that by such action the joint board would be prepared for any patients we might have. In addition to this, the board took the precaution to arrange with the owner of an ambulance to convey persons to this building. It was thought that they could be better provided for by this means, and that we could maintain the same temperature by using an ambulance. I think that the board acted wisely in this matter. We have had no cases of smallpox, and we do not want any. Here is the proposition I want to make: After this building was rented, and all the arrangements made, the farmers became very indignant and they issued and signed a petition to enjoin the city board of health from using this building. Their injunction was based on two reasons. One was that this building was too close to the highway, and the other reason was that it was too close to the school house. The trustees were somewhat exercised about the matter. I notified the two boards that we would not remonstrate. On our side of the board there were two physicians, and they said there was absolutely no danger. The patients could be isolated, and there was absolutely no danger so far as the school house was concerned. I would like to know from Dr. Seys whether our position was correct or not.

Dr. Andrew Heinlein, Health Officer of Bridgeport—I would like to ask the gentleman from Galion whether any precaution was taken by them in the way of vaccination. In my judgment that is the first thing to be done as a precaution against smallpox. If Galion is in danger they should go to work and vaccinate every person in the town. In 1895 we had the same experience with smallpox. At that time I was the health officer and we had 72 cases. The only way we could stamp it out was by vaccination. We gave each physician a certain territory. After that was done we had a physician for each public school, who saw that each child was vaccinated or had a recent scar before he was allowed to attend school. In that way we had every one vaccinated, and in a short time it was all over with us. I remember an instance of a family having smallpox. The children except two had been vaccinated in New York State. The father and mother had been vaccinated in early life. The father had taken smallpox in Wheeling, W. Va., and communicated it to the family. The only ones not taking the smallpox were those that had recently been vaccinated. I was much pleased with Dr. Seys' paper. Every word of it is true, and if the public would only follow out his precautions I believe we would have no smallpox in the United States. I am satisfied that thorough vaccination is the only effective remedy against smallpox.

Dr. W. A. R. Tenney, Health Officer, of Cincinnati—I do not think I can add anything to the paper of Dr. Seys in regard to the means of prevention of smallpox or the diagnosis of it, and I will not take up any time to discuss these features of the disease. I thought it might be interesting to give you some of our experience in Cincinnati. I agree with the paper that has been presented, and we are adopting the same means for the prevention of the disease. The first case in Cincinnati was that of a colored person, aged 21 years, and these cases will serve to give you our experience with the disease.

Case 1, Annie Brock—Colored, age 21 years, domestic; has had diphtheria, chicken-pox, measles and pneumonia. Never vaccinated. Admitted November 30, with a papular eruption over face and body; temperature 99, pulse 110; able to sit up. Was taken sick November 23, with severe pains in the head, back and side, which subsided on the 26th. Eruption pursued the usual course and dessication began December 7. Was discharged, cured, January 9.

Case 2, Charles Johnson—Colored, age 30 years, laborer, single; has had pneumonia, lumbago; vaccinated when a boy. Taken sick November 25. Admitted November 30, papular eruption on the face and body; temperature 98.5, pulse 88; dessication began December 30. Discharged, cured, January 5.

Case 3, Edgar Hall—Colored, age 26, single, laborer; had never been sick. Admitted December 1, papular eruption over the face and body. Dessication began December 5. First taken sick November 30; no premonitory sickness. Discharged January 1. Never vaccinated.

Case 4, Charles Floyd—Colored, age 22, roustabout, single; never sick before. Admitted December 1, having been sick several days. Eruption papular and over the entire body. Dessication began December 8. Discharged, cured, January 5.

Case 5, John Scott—Colored, age 29, roustabout, single; has had bronchitis, malarial fever, syphilis; never vaccinated. Taken sick November 27; temperature 100.4, pulse 88, R. 24. Had several hemorrhages from the nose and throat, losing in all about two pints. Eruption papular and over the entire body. Discharged January 8.

Case 6, William Stern—Colored, age 23, railroader, single; never sick before. Admitted December 2. Never been vaccinated. Taken sick on the day of admission; eruption papular on the face and chest. Dessication began December 8. Discharged January 8.

Case 7, Montgomery Thomas—Age 40, laborer, single; pneumonia 20 years ago; never vaccinated. Was admitted December 4; taken sick November 28; eruption papular. Dessication began December 10; had numerous abscesses on the face, which have prevented his discharge.

Case 8, Joseph Crawford—Colored, age 22, single. Admitted December 4. Has had typhoid fever; taken sick November 27; eruption vesicular. Dessication began December 13. Discharged January 1.

Case 9, Luther Conway—Colored, age 28, single, roustabout. Never sick before; admitted December 5; taken sick December 3; eruption papular on the face and chest. Discharged January 16.

Case 10, Delia Massie—Colored, female, age 39, single. Never sick before; admitted December 17; taken sick on the 14th; eruption slight, papular, which dessicated in a few days. Discharged January 6. Vaccinated when a child.

The foregoing cases, with the exception of case 7, are the only ones that have been discharged. All give a somewhat similar history of having been sick for about a week before admission. The chief complaints being severe headache, pain in the back, chills and fever. These continue with greater or less severity for several days, when they subside and the papular eruption appears. Of 32 cases admitted, 28 have been colored males, two white males and two colored females. Only two have been vaccinated; five have had chicken-pox when children. One had profuse hemorrhages from the nose and throat, and three have suffered from abscesses due to specific infection. The temperature in only one case has indicated severe toxanemia (case 5). The temperature chart is characteristic in the majority of cases of variola. All cases so far admitted, while presenting symptoms at times that indicated severe poisoning, have progressed favorably, and we can anticipate in all a speedy and satisfactory recovery.

L. T. Sheets, Tippecanoe City—In our township we had smallpox. Dr. Probst was there and made the diagnosis. In our adjoining township there have been 35 cases, and out of the 35 cases, only two had been vaccinated. In one township there was one party, a laborer, who was working in the infected district. He came into our town and he was quarantined. He went into a house where there were five men. We then quarantined the whole house. One of the boys had a little girl who came to visit him, and she was quarantined with them. We confined the smallpox to that one house. They were discharged last week. In regard to guards, will say that we at first put them on their honor, as the doctor suggests, and put spies among the neighbors. The plan was not effective with us. We found that the people wanted more to come in than they did to go out. At the time this man was exposed, our physician suggested vaccination to him, but he, knowing the mildness of the disease, said he preferred the smallpox to the vaccination. Our board of health was very proud of the fact that we had smallpox in our town and was able to confine it to one house.

Dr. J. Erwin Stafford, New Carlisle—We have some cases of smallpox in our town. We have two families now, and I would say that we had one family in which the head of the family refused to be vaccinated. The children in that family are now having the smallpox, and I would like to ask this convention as to the length of time the head of the family should be quarantined. We have had seven families within the last two months. I would like to have the opinion as to the length of time they should be quarantined.

D. M. Rings, Amline—We had some smallpox up there with us. We had it in two families, and we had Dr. Probst up there. We cannot make our people believe at all that it was smallpox. We had a hard fight in regard to the matter, and our people have such a feeling toward the board of health that it is hardly safe for us to go out at night. I should like to hear from Dr. Probst in regard to these cases, and in regard to the appointment of guards.

Wilbur Fisk, Lima—I want to say, in regard to quarantine, that I think the people up our way are just as loyal as any people in the State. I want to say, also, that it is wrong, I think, to make sanitary policemen out of the members of a family. I think it is a dangerous thing to do.

Dr. W. A. Daugherty, Health Officer, of Bucyrus—In regard to the matter of vaccination, I will say that we have had some experience along this line during the past two or three years. We have had vaccination among children, and it is claimed by some of our people, that some of the children vaccinated have not seen a well day since. This condition is, no doubt, due to the virus used. I think it would be a good plan to have the virus purchased by the board of health, and then they could see to it that this virus is good.

Dr. J. N. Hanley, Health Officer, of Chillicothe—I just want to make a few suggestions on this question. We have no cases of smallpox in Chillicothe, but we have smallpox close to us. The former health officer of Chillicothe did not employ guards in cases of smallpox and scarlet fever, because he regarded it as too expensive. I have been the health officer of Chillicothe since last June, and I found the plan more efficient without the guards with us. When a house is quarantined for contagious disease, the health officer goes there and gives them directions and gives them the laws. The people on either side of the street are notified as to what is expected of them in regard to going there. Then the superintendent of the schools is notified of the case, and he notifies the principal of the school which is located in that district where that child goes, and the people are given to understand that they are subject to penalty for any violation of orders. For the head of the house, we give him the opportunity to stay in or go out. If he has been exposed, of course we keep him in. We make it the duty of the sanitary policeman to visit these localities once a day. Our city contains a population of 16,000. If the law is disregarded, we are notified by some one in that neighborhood. Since my term of office began in June, I have had to make an example of two persons. One of these, I am sorry to say, was a physician who disregarded the law. He paid his fine, and now sees the error of his way, and we have had no trouble since that time. I want to say that we have accomplished more without the guards than we could have accomplished with them. We have had a number of cases of diphtheria, and we have had no cases develop in a neighborhood from the cases in that neighborhood. In regard to the matter of vaccination, I want to say that I received the notice from the secretary of the State Board of Health. I do not believe, under the law, that we can compel compulsory vaccination, unless we have cases of smallpox in the town. I called the board together and we began to vaccinate, and we are still vaccinating. All children who are not vaccinated will be refused admission to the public schools.

Dr. W. A. Daugherty, Bucyrus—I would like to ask Dr. Seys in regard to the burning of the clothing and bedding in case of smallpox. I would like to ask him if he really thinks it is necessary to do this.

Dr. H. H. Seys, Springfield—I stated simply the clothing, and I do not think it necessary to have the bedding burned if there are proper methods of disinfecting. Formaldehyd gas, I think, will answer the purpose; and yet, a case occurred in New York where a building was thoroughly disinfected, and a woman gave birth to a baby 18 months afterward, and the baby had the smallpox. This shows us how very difficult it is to thoroughly disinfect in this disease. The gentleman from Galion asked me in regard to their pest house, with reference to the school house. In regard to the correctness of their positions, I will say, yes. In some report that I have read on smallpox, there is a case reported in which some carpenters were at work on the opposite side of a river 1,500 feet wide, and there was no means of communication anywhere. The poison crossed the stream and attacked some of these carpenters. This shows that the poison can be borne for a considerable distance. Dr. Probst reports a case of a person contracting the disease by sitting by the roadside in the vicinity of a smallpox patient. In this case there was no other chance of communication of the contagion. In the paper, I said that this was a free and independent country, and every man has the right to have the smallpox if he wants it. I said, in my office, the other day, that the race of fools is not dead yet. If I could have my way, I would give the smallpox to about 16 people in Springfield. (Applause.) We have people who talk about their rights and their privileges. They endanger the lives of their neighbors, and leave their children exposed to the disease. We had smallpox in our town five years ago, and the position taken by some of our people was agonizing. They know more to-day than they did then. I think the people of New Carlisle will know more in the future than they know now. A corn stalk may be 18 inches high, or it may be 18 feet high, and yet it is a corn stalk. So smallpox is smallpox, whether it be of the mildest character, or whether it is of the frightful hemorrhagic variety. There was another statement that I made, and that was that vaccination was a greater protection than the smallpox. In a series of deaths, those protected by vaccination, showing no scar, was 24 per cent.; in those cases showing one good scar, 8 per cent.; in those cases showing two scars, 5 per cent.; and in those cases showing four good scars, $\frac{55}{100}$ per cent. That is to say, in 19 deaths, there was a little over one-half of 1 per cent. in cases where they had been thoroughly vaccinated. You should impress upon your friends that they will have absolute protection from smallpox if the vaccination has been efficiently and thoroughly done. Now, in regard to the virus to be used, it has been suggested that the board of health shall purchase the virus, and the manufacturers shall give a guarantee of its quality. I believe very often more evil results follow from a dirty arm than from impure virus. I would suggest that you scrape the filth off the arm. We could go back to the old-fashioned way of vaccinating from arm to arm. Statistics show that this is a good plan. I challenge you to show that humanized virus has ever caused disease, unless it occurred through the carelessness of the vaccinator. In regard to the matter of transmission of disease by humanized virus, I would say that I do not believe it. I regard animal virus as less rapid in its work and more liable to produce suppuration. If care is taken, there need be no danger. I have recently vaccinated 1,000 children, and have had no bad results.

Dr. Bryon Stanton, Cincinnati—I want to speak a few words on this subject. I want to speak of the glycerinized virus I have used. I would have no objection to humanized virus if I could always select the person. I have used the animal virus for a number of years. I used the ivory points. This year I have used the glycerinized virus, put up in hermetically sealed tubes. The results have very agreeably surprised me, and I have been much pleased with them. One child I vaccinated without results. I believe that child is an immune. It has been vaccinated five times and has never taken the vaccination. Out of the number vaccinated, I had 19 persons in which it was successful in the first vaccination, one that was successful in the second vaccination, and one that was successful in the third vaccination. I want all persons to present a typical appearance of a good vaccination. One of the children had an arm which presented a red appearance for some distance around. I have seen nothing like a severe case. I think my mode of vaccinating is better than vaccinating from arm to arm. I believe the virus now put up, because of the competition, is good, and I am willing to trust it to the manufacturers; believe it is more satisfactory than the old method of vaccination.

Dr. Probst—I want to emphasize one point in Dr. Seys' paper that has been verified in my own experience, and that is the necessity for early vaccination. In going to a place to advise with regard to smallpox, the first thing I do is to find out who has been exposed, and then advise early vaccination. But it is a common thing to go into a house where they have had smallpox for a week and find members of a family that have not yet been vaccinated. The essential point is to hunt up every exposed person, vaccinate them, and keep them under observation for at least 16 days. One point, with regard to the matter of quarantine without guards—I think it is possible in selected cases. You may have smallpox in families where you can maintain a quarantine without guards. This was successfully done by the mayor of Wapakoneta in their recent epidemic. They gave the man ordinary wages, and they put him on his honor in regard to going and coming, and did not pay him if he violated quarantine.

Dr. Andrew Heinlein, Bridgeport—We have had some severe cases in our town. It was a very hard matter at first to get some of the "old women" to believe that it was smallpox. They knew, because they had had experience, and it was too mild. I told them that we would have some severe cases and we did. I believe it was an act of Providence, and that did open their eyes. Until some one died they did not believe it. Out of 72 cases we lost seven. I was called in consultation in a case of a man who died. The only symptoms he had was a severe backache. That was the only symptom, but eight hours before death hemorrhagic spots appeared. A post mortem examination showed a diseased liver. We found from this case 11 persons who had been at the funeral. I advised against it. My advice was not taken, and from that funeral we had two cases.

Dr. L. F. Laudick, Health Officer, of Lima—During this discussion the subject of quarantine came up, and something was said in regard to employing the members of the family instead of guards. We had smallpox in Lima four years ago, and we are still afraid of it. Our experience in quarantining diphtheria a year ago was such that I would not trust a man to guard his own home. There was a man in our town whom I thought to be a man of honor. I started out with two guards, relieving each by turns. It was very expensive. The board trembled for fear the council might say something, because there were so many cases. We had

18 cases in the city, and I had 40 men employed at $1.50 a day. Then I thought I would take a different method and let some of the men guard their own homes. One man who was supposed to be receiving his $1 50 per day was found to be going among his neighbors carrying water and doing various things purely for meanness. So I put a guard over him, and then he tried to play tricks. I told the guard to bring that man to the workhouse or knock him on the head. The guard did not do that, but he threw him back on the porch. The news came to me that there was trouble and there had been a fight. From that time I trusted nobody to guard their own homes. If you can do it without guards you can do it better than we can. If there is any way to do it without having two guards I should like to know it. In regard to the matter of vaccination, I will say that we have a nice little city situated in the middle of the oil field and we have all kinds of people coming to live there. We have not had any cases yet, but I do not want to brag for fear we shall have. We asked the school board to enforce vaccination and they have. I do not believe that there are five hundred people in Lima that are not vaccinated.

Dr. W. A. R. Tenney, Cincinnati—I want to say that there is not a single case in Cincinnati to-day that is not isolated in the hospital. Every case we have is isolated in the branch hospital for such cases.

Mr. M. C. Reed, Hudson—I want to say only a word. We have had no smallpox, but we have had diphtheria. We have a good health officer and we have good sanitary policemen. We have adopted this rule in our place. In quarantining a place the necessary papers are put up and if the man is a laboring man he takes his choice between going away and sending his earnings to his family or staying at home. Any person who violates the law is arrested and dealt with. I have given out that the law will be strictly enforced. We had a case of scarlet fever and the man we found was milking his cows and sending the product to Cleveland. He was ordered to destroy the milk and he immediately complied with the law. That was one case where we enforced the law. We have done this without any expense to the corporation. We order them to arrest any party going out or coming in.

Dr. Laudick, Lima—Mr. President, I move that you close the discussion. There are other questions to be considered here, and we should not put all the time on this discussion.

President, Dr. Kahle—I wish also to announce that the State Board of Health laboratory is located in the Board of Trade building, and our bacteriologist will take great pleasure in having you visit it, and showing you through it. I hope you will avail yourselves of the privilege.

THE POLLUTION OF PUBLIC ICE SUPPLIES.

BY J. C. CROSSLAND, M.D., MEMBER OF THE OHIO STATE BOARD OF HEALTH, ZANESVILLE.

When I consented to prepare a paper for this meeting on the pollution of ice supplies, I supposed the object of such an effort would be two-fold, viz.: primarily, to determine, if possible, whether any considerable portion of the ice supply of this State is contaminated, and, if so, whether said contamination is of such character and extent as to constitute a menace to public health; and, secondly, to consider what means could and should be taken to prevent such danger. If our water supplies were wholesome, we might, in a general way, infer the wholesomeness of our ice supplies, at any rate so far as the natural product is concerned; but, unfortunately, our water supplies are not unpolluted. Moreover, we have to consider the fact that in many instances ice is harvested from waters which would not be considered fit for domestic use. Then, too, whatever purification results from freezing is to be considered. Therefore, it would seem that an independent investigation would be necessary to determine the healthfulness of the ice supply. To undertake to secure samples from all sources would be an almost endless and unnecessary labor. Sufficient, however, would be required to afford a fair representation of the supply throughout the State.

In the eleventh annual report of this Board will be found the following questions concerning ice, propounded by the Secretary of the Board to health officers of towns over 4,000 inhabitants:

First—What proportion of the city's ice supply is taken from waters within or near city limits?

Second—Is this supply liable to be contaminated?

Third—What steps, if any, have been taken to prevent such contamination, or sale of such ice?

After examining the answers to these questions, which come from about 60 towns, I selected 22 places from which to obtain the samples for examination. These selections were made with a view to procuring samples from every kind of source, and from localities throughout the State. Judging from the information above referred to, it was expected that places selected were among those most liable to afford a polluted ice supply. Out of the 22 places, we succeeded in obtaining samples from only eight places. This was due in part perhaps to the fact that this work was begun late last year—late in November, and when the year's ice crop was about exhausted. Some of the samples were obtained, I observed, from ice produced by the cold period in December last.

Judging from a communication which I received through the Secretary of the Board from an ice company, there seems to exist in the minds of some of the ice dealers, who have been asked for samples, an apprehension that this investigation was being limited to one branch of the ice industry, and that the results of such an investigation would prove injurious and unjust to one branch and beneficial to another branch of the industry. I wish to say that this is an erroneous impression; that nothing of the kind was thought of; that our investigation involves both branches of the industry. I wish to assure every one engaged in the ice industry in this State that no one present or represented at this meeting wishes or intends to injure or deal unjustly with one or another branch of the industry. The communication referred to, which, by the way, is a very creditable one, defends one branch of the industry, while contending that the other is more in need of investigation. To such contentionists, whatever branch of the industry they may represent, I would say that I know of no better and more infallible means of determining the wholesomeness of ice than by chemical and bacteriological analyses.

BACTERIOLOGICAL ANALYSES BY E. G. HORTON.

Report on bacteriological examinations of samples of ice from the following cities: Dayton, Circleville, Kenton, Tiffin, Niles, Warren and Newark.

DAYTON ICE.

Laboratory numbers—14, 17, 18.

Received—No. 14 December 2, 1898. No. 17 and No. 18 December 14, 1898.

Cut—No. 14——.

Cut—No. 17 and 18 December, 1898.

Source—No. 14, artificial ice, from Dayton Artificial Ice Company.

Source—No. 17, Binn Ice Company. From an artificial lake, fed from Miami and Erie canal, near Mad river aqueduct.

Source—No. 18, Riverdale Ice Company. Miami river, above Dayton, below the mouth of Stillwater river.

Appearance—No. 14, clear, solid.

Appearance—No. 17, clear with a few bubbles and a little dirt.

Appearance—No. 18, clear. A few bubbles.

Probable pollution—No. 14, none.

Probable pollution—No. 17, " Above the aqueduct on the canal is a large slaughter house and packing establishment emptying more or less refuse into the canal."

Probable pollution—No. 18, not given.

Sent by Dayton Board of Health, W. D. Gifford, Clerk.

Number of bacteria per c. c.—No. 14, none. (In one of the four tests a single colony developed, doubtless an air contamination.)

Number of bacteria per c. c —No. 17, 238.

Number of bacteria per c. c —No. 18, 13.

Character of bacteria—No. 17—colon bacillus found.

Character of bacteria—No. 18, colon bacillus not found.

No. 17. The slaughter house referred to is about one-fourth of a mile above the artificial lake.

CIRCLEVILLE ICE.

Laboratory numbers—15 and 16.

Received—December 13, 1898.

Sent by—J. L. Cummins, Health Officer.

Cut—This winter.

Source—No. 15, from a regular ice pond, fed from canal.

Source—No. 16, from canal proper, one mile south of city.

Appearance—No. 15, upper half clear, lower half some bubbles.

Appearance—No. 16, bubbles all through.

Probable pollution—"I know of no source of unnatural pollution."
Number of bacteria—No. 15, 115.
Number of bacteria—No. 16, 13250.
Character of bacteria—No. 15, colon not found.
Character of bacteria—No. 16, colon present.

KENTON ICE.

Laboratory numbers—19 and 20.
Received—December 15, 1898.
Sent by—F. H. Fall, Health Officer.
Cut— ———.
Source—No. 19, from pond.
Source—No. 20, from river.
Appearance—No. 19*a*, upper portion decidedly snow ice.
Appearance—No. 19*b*, lower portion solid, with few bubbles.
Probable pollution— ———.
Number of bacteria per c. c.—No. 19*a*, 50. } Average 28.
Number of bacteria per c. c.—No. 19*b*, 6.
Nnmber of bacteria per c. c.—No. 20, 1780.
Character of bacteria—No. 19, no colon found.
Character of bacteria—No. 20, colon present.

TIFFIN ICE.

Laboratory numbers—21 and 22.
Received—December 17, 1898.
Sent by—Dr. A. C. Schwartz, Health Officer.
Cut—This winter.
Source—No. 21, Sandusky river, north of city. Smith Ice Company.
Source—No. 22, Rock creek, east of city. Seney Ice Company.
Appearance—No. 21, clear.
Appearance—No. 22, clear; not quite so good as No. 21.
Probable pollution—No. 21, the city sewage.
Probable pollution—No. 22, several large hog pens on the creek bank. Green Lawn cemetery one-half mile above.
Number of bacteria per c. c.—No. 21, 84.
Number of bacteria per c. c.—No. 22, 283.
Character of bacteria—No. 21, colon present.
Character of bacteria—No. 22, no colon found.

NILES ICE

Laboratory number—25.
Received—December 19, 1898.
Sent by—Dr. C. C. Williams.
Cut—This winter.
Source—Mosquito creek.
Appearance—Upper portion contained bubbles, lower nearly clear.
Probable pollution—An open sewer empties into the creek 50 to 75 yards below the ice field.
Number of bacteria per c. c.—63.
Character of bacteria—No colon found.

WARREN ICE.

Laboratory numbers—26 and 27.

Received—December 19, 1898.

Sent by—T. B. Webb, Sanitary Policeman.

Cut—This winter.

Source—No. 26, 1,000 feet above water company's dam.

Source—No. 27, 300 feet above Market street bridge.

Appearance—No. 26, solid ice, clear.

Appearance—No. 27, upper portion solid, clear.

Probable pollution—No. 26, "County infirmary, having about 120 inmates, (excepting water closets in men's department), all the refuse, closets, sinks and drainage from barns and hog pens, empty into Young run two miles above."

Probable pollution—No. 27, between the points 200 feet and 3,300 feet above where this sample was taken, there empties into the river the sewage from 20 closets, 33 slop bowls and three large barns and yards. Three hundred feet below where this sample was taken is the mouth of Market street sewer.

Number of bacteria per c. c.—No. 26, 67.

Number of bacteria per c. c.—No. 27, 43750.

Character of bacteria—No. 26, one single specimen of colon, a typical.

Character of bacteria—No. 27, typical colon bacilli in great abundance.

NEWARK ICE.

Laboratory numbers—28 and 29.

Received—December 20, 1898.

Sent by—Dr. J. P. H. Stedem, Health Officer.

Cut— ———.

Source—No. 28, (small piece).

Source—No. 29, (large piece).

Appearance—No. 28, bad. Bubbles all through, very dirty. A thin layer of snow ice on top.

Appearance—No. 29, bad. A trifle better than No. 28, but still very dirty.

Probable pollution— ———.

Number of bacteria per c. c.—No. 28, 14060 (in three days).

Number of bacteria per c. c.—No. 29, 598.

Character of bacteria—No. 28, colon present.

Character of bacteria—No. 29, colon present.

In the seventeen samples, the colon bacillus was found in eight samples. Vast numbers of bacteria were found in three samples. A large number were found in two samples. Six sources of supply were exposed to well-known sources of pollution. There were other probable sources of pollution. Now, I think, we will agree that the result of these analyses does not indicate a sufficiently wholesome ice supply, and, while they are few and insufficient to base a conclusion on, when considered together with general sanitary principles, I think we must conclude that our ice supply ought to be, and could be made much more wholesome if properly regulated. Now, while the above investigation was being conducted, we were seeking information in another matter, as follows: A circular letter was sent to other state boards containing the following questions:

First—Have you a law or rule of your board to prevent the pollution of public ice supplies?

Second—If so, when was such law or rule enacted?

Third—Can you send me a copy of such law or rule, or advise me where it can be found?

Fourth—Do you consider the dangers from the use of polluted ice sufficient to warrant the enforcement of a law preventing pollution?

Fifth—Has the operation of your law been satisfactory?

Sixth—Have you any suggestions to make as regards changes?

Seventh—Did you have chemical or bacteriological analyses of samples of ice made prior to or subsequent to the enactment of your law?

Eighth—If so, what did they show?

Ninth—If not, upon what would you base an argument for the enactment of such a law?

Answers were received from the following twelve states: Rhode Island, New Hampshire, New York, Michigan, New Jersey, Massachusetts, Minnesota, Iowa, Wisconsin, Maine, Pennsylvania and Connecticut. We will summarize the information obtained by this means, as follows: Connecticut, Massachusetts, New York and Wisconsin have a special law concerning ice supplies. In New York the ice supply is protected by the public health law. In New Hampshire, the law concerning public water supply includes ice. In Minnesota, the law prohibiting the pollution of streams is believed by the health officer to meet the requirements. Question four, concerning the necessity of legal protection of ice supplies receives eleven affirmative and one negative answer. In four states, analyses have been made, and results expressed as follows: In 11 samples, one gross contamination; pollution frequently demonstrated; much pollution; considerable pollution. The operation of these laws has been reported as fairly satisfactory. The question, "Upon what would you base an argument for the enactment of such a law," receives the following answers: General sanitary principles; Prudden's investigation showing pathogenic germs; typhoid and colon bacilli not destroyed by freezing; upon the laws of nature, which concern public health; inspection of source of supply; danger from pathogenic germs; upon results of analyses and observations made by competent experts; because ice is cut from waters known to receive sewage; typhoid germs not destroyed by freezing, and that natural ice is almost always cut from polluted waters.

After a hasty examination of the special laws of Wisconsin, Massachusetts, New Jersey and Connecticut, I believe New Jersey has the most simple law, and one which can be enforced without injustice or injury to any one, and with the least friction. The law is brief, and reads as follows:

1. That no ice shall be cut for the purpose of being sold or used in any city of this State from any pond, creek or river within the limits of any such city, unless a permit therefor shall be obtained from the board of health of such city, and no person or persons shall sell or deliver any ice in any city in this State without first obtaining a permit therefor from the board of health of such city, and it shall be lawful for any such board of health to refuse a permit and to revoke any granted by them, as aforesaid, when in their judgment the use of any ice cut or sold, or to be cut or sold, under the same is or would be detrimental to the public health.

2. That the board of health of any city may prohibit the sale and use of any ice within the limits of such city when, in their judgment, the same is unfit for use, and

the use of the same would be detrimental to the public health, and the said board may prohibit and through its officers stop, detain and prevent the bringing of any such ice for the purpose of sale or use into the limits of any such city, and also in the same manner stop, detain and prevent the sale or use of any such ice found within the limits of such city.

Section 3 defines the penalty.

SUPPLEMENT.

1. That the provisions of the act to which this act is a supplement, be and the same hereby are extended to all boroughs, townships, towns, and other local municipal governments in the State.
2. That this act shall be deemed a public act and shall take effect immediately.

Dr. L. F. Laudick, Lima—I am afraid that this paper will not have the effect that it should have. I think we are ignorant of the possibilities of the ice supply being contaminated. There are few of us that realize the contamination of ice. The secretary sent me a letter asking me for a sample of ice. Our ice supply is from a good source. It is a private basin. It was not possible to send it. We get most of our ice from what we call our water works reservoir. We have had ice from all sources. The past few years we have been having better ice. A majority of the people think that if the water is frozen that it purifies it. I used to think so, too. We have found out differently, and the more care we exercise in selecting our ice supply the better it will be for the people who use it. There is no doubt that the germs producing typhoid fever are not destroyed by freezing.

Dr. J. B. Schueller, Health Officer, of Columbus—There is a question as to who shall make this examination, whether the bacteriologist or the chemist. We have a State chemist and bacteriologist. He is overworked at present. I am at his laboratory often and I know this to be true. But few cities in the State have their own laboratories and are prepared to do their own work. We have had for the last nine months in our city a laboratory, but the trouble is that they fixed the salary of the chemist at $400 a year. We cannot make demands on the health officers. We cannot get a competent man for $400 a year. It is utterly impossible for one man to do the work. He has enough to do to examine the sputum of persons who are supposed to be affected with tuberculosis, and from children affected with diphtheria. Who shall do it? To my knowledge there are only the cities of Cleveland, Columbus and Cincinnati that have laboratories open. It would be necessary to refer such cases to the State chemists, and they could not do it. In our city I think about one-half of the ice used is made from distilled water. This ice is manufactured by the Crystal Ice Company. They furnish pure ice. Besides that, we have other companies selling ice to our people. The ice made from the distilled water has never been analyzed. I think it would be worth while to examine it. Every city in the State should have a chemical and bacteriological laboratory, and an expert employed, and pay him a good salary for the work done. Under the present circumstances it is almost impossible to examine the ice.

Dr. Byron Stanton, Cincinnati—I do not believe that in Ohio there is a thousand pounds of ice sold annually that is made strictly from distilled water. I know that all the companies propose to do it, but if all the processes were carried out it would make it too expensive. It cannot be done. I think the best way to control the selling of ice would be to adopt a plan of enacting and enforcing such a regulation as they have in New York. There it is placed in the hands of the Board of Health, who determine it by analysis as well as passing upon the quality of the ice by knowing the source from which it came. I believe that manufactured ice is better than the natural ice, because it is most generally made from the water used by the city. The natural ice is generally cut from the ponds or basins around the city and is not as good water. I think that water supplies which are not fit for domestic use are not fit for ice. Although many organisms are doubtless destroyed by freezing, yet many pathogenic germs are not destroyed.

Dr. Reed -I want to ask if there is any serious dangers from the use of impure ice when it is used in the refrigerator. I know that the ice used in our city in that way is polluted. I want to ask whether there is any danger.

Dr. C. A. Grahn, South Charleston—This subject is one in which I am very much interested, inasmuch as the greater portion of the ice used in our town is taken from ponds where, during the summer season, we see a number of cattle wading in it. The ice shows it, too, by its color, which is always clearer at the top than at the bottom. Now, we have to use ice but I do not like to use it, professionally, as we have to. I want to know how to obtain good ice. We have some manufactured ice, but towns of our size generally use this impure ice supply. But the public are with that matter a little like they are with vaccination. They think that if the water is frozen it kills all the things that are noxious. I would be pleased to have an ice supply like you have in this city, but we cannot have it.

W. L. Sievers, Ashtabula—We catch several hundred pounds of fish every day and this fish is packed in polluted ice and shipped. We are trying to find a way to put a stop to it. How shall this be stopped? If this water is not fit for fish to live in, it certainly should not be fit to ship the fish in. We ship frozen fish.

Stanton E. Hoover, Croton—Every bit of ice used by our butchers is taken from a pond in the rear of the village fed by a stream which runs through the village. I cannot tell you how many stables are located along the line of this stream. Can we do anything to prevent it? Is it not dangerous? I never knew of this ice being used for drinking purposes, but they use it for refrigerators.

Dr. H. L. True, McConnelsville—It seems to me that the local boards of health can control this matter of ice supply just the same as they control the water supply. In certain towns they have public wells and the local boards of health shut up these wells when they regard them dangerous to the public health. If they can do this I think they can stop the sale of ice that is polluted. They certainly have the power to stop the use of ice if it is dangerous. In regard to the question by the gentleman about the shipping of the frozen fish over the State, I do not think there is any person in the State who eats his fish raw. The cooking of the fish would kill all the microbes. I do not know that impure ice in a refrigerator would pollute the meat.

Dr. M. F Hussey, Sidney—The question that we are discussing now will be discussed for many years. As long as water will go down to a temperature of thirty-two degrees we will use a polluted ice supply. The cities which have a good water supply will get good ice, but for the smaller towns which have no water works, but have cesspools where the stock is allowed to run in it, you will have polluted ice, and it will be used. The people should be educated to use pure ice. If we use ice for cooling purposes there is not much danger in using it. It is a matter of education. As soon as we are educated to believe that polluted ice is dangerous, we will not use it. Our supply, I think is good, it comes from the canal

Dr. Crossland—It has been stated during this discussion that we have sufficient law on this subject of contamination of ice. I know that we have law enough, but we want if possible, to avoid friction. I think we can control this matter without resorting to that means. That is the very reason I recommend the adoption of the New York laws. As was said by Dr. Stanton, if you fix a standard and let the dealers know what is expected of them and if they do not comply, then they are to blame. In the matter of discriminating between the different kinds of ice, I say that I think this is wrong. I believe it to be a better plan to allow no ice sold unless it is regarded as being fit for use. Just as long as you allow this, you will be imposed upon. In regard to the question of the fish, I want to say that there is danger. You may cook the fish, but with some persons they will be put in the refrigerator where you keep meat and butter, and they will absorb the impurities of this water. The great trouble in being able to educate the public to take the necessary sanitary precautions is the fact of the almost universal belief that freezing is a guaranty against impurity. They think that it makes it pure, but investigations show that this is not true, except to a limited extent. Perhaps some of you have looked up this subject. I heard one health officer state that there was only one-tenth of the impurities left in ice after freezing. In regard to the report from Sidney, I will say that if the gentleman will look over the reports, he will not feel so sure about the ice in his town.

Dr. Probst—I think, Mr. President, that this is a very important matter. I would like to make a motion that a committee be appointed from this body who shall investigate the whole matter and make a report at the next meeting of this association. I move a committee of three be appointed for that purpose. Carried.

President Kahle—Gentlemen, this closes the program for this session, and we have a number of questions here to be announced. If there be no objections, we will take up these questions.

Question—In cases of suspected diphtheria shall the house be placarded at once or only after the diagnosis has been confirmed by a microscopical examination.

Dr. J. B. Schueller, Columbus—I wish to state an instance which made me submit this question. For the last nine months we have had a bacteriological laboratory. In former years all cases of diphtheria were reported to the health office and the house was placarded at once. Since the laboratory has been open all cases of diphtheria have been examined and some physicians take exceptions to having their houses placarded before the bacteriologist has proved the diagnosis by microscopical examination. This has been going on all through the summer. A few months ago, when I was getting material for my report, I found that some houses had not been placarded. Some physicians would not report cases except the houses would not be placarded until the diagnosis had been confirmed. I protested against that, for the reason that it takes 24 hours to make the examination, and the house could not be quarantined for 24 hours after the case was reported. I have been criticised quite severely by the medical profession and the newspapers. In order to inform myself on the subject I have written to Cincinnati, Cleveland, Detroit, Milwaukee, Washington, New York City and Pittsburgh and other places. I have received answers from eight of them. From their letters I learn that in four cities they do not placard the houses until after the microscopical examination. Then they placard the house. In the case of some cities, like Washington, they are very indefinite about their rules. Three cities placard the house at once. In Boston and Milwaukee they placard the house at once and then an examination is made. If they find the bacillus they leave the card on; if they do not find it, they take the card off. This is the rule in these cities. I have consulted the Secretary of the State Board, and he stands by me in placarding the houses. In Cincinnati they do not placard at once. Now, I would like to hear from the gentlemen present in regard to this matter. I would like to know which is the best plan, whether to placard at once or only when the diagnosis is confirmed by the microscopical examination.

Dr. Probst—I believe in placarding at once houses in which diphtheria is reported; but, as I said to Dr. Schueller, when he consulted me about the matter, it would be better, in my judgment, to placard such houses "quarantined on account of suspected contagious disease." This plan would protect the public and also the physician who reports the case. We must be careful in our quarantine measures not to place physicians in such a position that they will hesitate to report their cases of contagious diseases.

Dr. W. A. Daugherty, Bucyrus—As there are a number of questions to be answered, I would move you that it is the sense of this convention that houses should be quarantined immediately, as the first few hours are worth more than the next 24 hours. Carried.

Dr. C. A. Grahn, South Charleston—In reference to that matter, in the town of South Charleston I do not see any other way but to placard the house immediately. You may be able in some cities to do otherwise, but in our town I am decidedly in favor of placarding at once.

Question—Would you advise quarantine in mild cases of scarlet rash or sore throat?

Dr. Stanton—I would like to ask for information: What is scarlet rash? I know of no such disease. If it is scarlet fever, would say placard it.

Dr. Crossland—I think there is just as much cause for placarding in scarlet rash as there is in scarlet fever.

S. E. Hoover, Croton—I want to say that some of our doctors call it scarlet fever and some of them call it scarlet rash. I wanted to know if it is the same thing, and if it is the same, I wanted to know whether you would advise quarantine.

President Kahle—I think it should be placarded.

Question—What time in the year would be the best time to vaccinate?

President Kahle—I should say that the best time to vaccinate is at any time during the four seasons of the year.

Question—Can a coroner of a county remove a body that has committed suicide from one township to another without a permit from the board of health? If so, how will said board get a record of said body?

Dr. Probst—I will refer you to the law for the answer. It says no person shall remove or convey a corpse either for burial or transportation to or from any city, village or township without a permit from the board of health; and no common carrier, its agent, conductor or any other employe shall receive or convey the remains of a deceased person without first having complied with such regulations as shall be made by the State Board of Health.

Question—Is it the county or the township that ought to pay the expense incurred by smallpox?

Dr. Probst—I do not know that I can answer that question positively. The poor laws are very much mixed up. There is a ruling by the Attorney-General, in case of contagious diseases, that if they are paupers the expense of supporting them shall be borne by the infirmary directors, and the expense of quarantine shall be borne by the townships.

Question—In cases of smallpox, where the clothing is destroyed, who is to pay for the clothing?

Dr. Schueller—In that case the city must pay for the clothing. We had a case of the smallpox and it was paid out of the poor fund.

John G. Heinrich, Wapakoneta—In our town, in cases occurring in the corporation, the expenses were paid by the town, and in cases which occurred in the township the expenses were paid by the township. The clothing and bedding were paid for by the respective owners.

Wilbur Fisk, Lima—In regard to paying for clothing, I think it is a charitable act to pay for the clothing more than anything else. I do not think the law compels boards of health to pay for the clothing, but if the parties are poor the board generally pays it. I think the law says boards may pay for the clothing.

H. S. Clark, Oberlin—The question as I understand it is this. If the health officer had ordered the destruction of this clothing, then the board must pay for it, but if the parties themselves destroy the clothing, then they must pay for it.

Question—How can boards of health preserve the purity of the milk sold in the markets?

Dr. Stanton—There is a State law which fixes a standard for the butter fat, but the examination as to quality and the enforcement of the law is left to the local authorities. Unfortunately the standard fixed by the Legislature of Ohio is so low that you can remove half the cream, and therefore it is not much of a protection. The matter of rules and regulations for the selling of milk comes within the province of the board of health.

Question—Is it advisable to vaccinate when the subject is suffering from mild acute afflictions of the respiratory organs?

Dr. J. F. Marchand, Canton—Mr. Chairman, this question has been assigned to me without any consideration on my part except the knowledge I have in a general way. I make it a rule to exempt all children suffering from whooping cough or diseases of the respiratory tract unless there is an epidemic of smallpox. I have seen babies vaccinated at three days old when there were cases of smallpox.

Dr. C. A. Grahn, South Charleston—My reason for asking the question was that we have a second case of smallpox within four miles of our village. We have much influenza. This second case of smallpox is now in the stage of desquamation. Before he felt himself really sick he was in our village and shook hands with some of our citizens; the next day he was taken down sick. I want to know whether we should proceed to a thorough vaccination regardless of any who might be suffering from these afflictions.

Dr. H. L. True, McConnelsville—I believe I called the attention of the State Board two years ago to the fact that vaccination would stop whooping cough. I requested Dr. Probst to investigate this question and report at the next meeting. Twenty years ago I vaccinated a baby that was taking the whooping cough and it broke it up. I vaccinate to stop the whooping cough. I am surprised that no one has noticed that thing. I called the attention of Dr. Probst to it and I should like to hear from him.

Dr. Probst—I remember well about Dr. True calling my attention to this matter. It was a very interesting point to me, but I have seen nothing for or against it.

Dr. Marchand—I wish that we felt sure that it would cure whooping cough. If vaccination would cure whooping cough, we might say of it as an advertising agent said of his medicine; "That it acted on all the organs at the same time." It seems like the millenium. Please excuse me from using anything which has no ground to back it.

Dr. Stanton—I am not surprised at the statement made by the doctor in regard to vaccination breaking up the whooping cough, but I am surprised that so many are ignorant of that fact. It is stated in the books.

Dr. True—I want to call your attention a little further along this line; vaccination has the same control against scarlet fever and diphtheria. In thirty years' practice I have never known a thoroughly vaccinated child to die of scarlet fever. I have the first one to find yet. I found where some died of diphtheria, but in these cases vaccination was not successful. My theory is that vaccination produces a change like adolescence. I have no faith in any medicine to cure whooping cough except vaccination.

Dr. Stanton—I desire to say that in an article I read on the treatment of whooping cough they referred to this fact, that it will stop the disease, but they urged that it might not have a good effect on the vaccination. The writer of the article thought that the whooping cough would modify the vaccination to such an extent as to make it unprotective.

Dr. J. E. Foster, Coshocton—I feel that it is an important subject. I would like some one to tell me why vaccination is a good thing.

Question—Why will not vaccination prevent other eruptive diseases as well as smallpox? Why do you use cowpox to vaccinate?

Dr. Probst—There is only one satisfactory reason given, and that is that cowpox is smallpox. Dr. Hine of England, I believe it was, a few years ago vaccinated a heifer from a smallpox patient and got a vesicle like in so-called cowpox. From this he vaccinated another heifer, and from this one another. Finally he vaccinated children from the last heifer, and from these children other children, securing, apparently, typical vaccination. He sent some of this virus to many of the principal public vaccinators of other countries, who reported typical results.. If you accept this theory, that cowpox is simply smallpox in the cow, you have an answer to your question.

EVENING SESSION.

The evening session was called to order by the President, Dr. Kahle, at 7:30 P. M., who said:

Ladies and Gentlemen—The hour has arrived for our meeting to commence and I take great pleasure in introducing to you, as the first speaker on the program to-night, his Excellency, Governor Asa S. Bushnell.

Governor Bushnell—*Mr. President, Gentlemen of the Board of Health, and Ladies and Gentlemen:*

I have been asked by the Secretary of the State Board to come here to-night to speak a few words of welcome to you. It gives me great pleasure to do this. Apologetically. it must be said that I have been too busy to-day to prepare such an address as you are entitled to, and such as I should like to give. My remarks may be disjointed and brok-n, but you must straighten out the joints and reduce the fractures. [Laughter.]

I am glad to welcome you to night, as citizens of the greatest Commonwealth of all the Commonwealths of our nation, and it is a privilege to welcome you as members of the State Board of Health and of the Municipal Boards of Health of the great Commonwealth of which I spoke.

The year past has been a very eventful one. It reminds me of a story about a man who met another and told him that John Smith's wife was dead. "What complaint?" the neighbor asked. "No complaint at all," said the first man, "everybody satisfied." [Laughter.] It seems to me, this year, we are all feeling about that way. Everybody seems to be satisfied. It has been a year of great events. We have had a successful war. It took the United States just 113 days to conquer one of the great powers of Europe and to gain some of the greatest naval achievements of this or any other age. [Applause.] It only took us this time to win these great battles on land and sea, and the good part about it is that the results were as great to this country, and to the world, as though many lives had been lost. It established the fact that the United States has the finest navy that floats on the sea and that we have an army that is almost invincible, because it is composed of loyal, patriotic citizens of our country. We put this army into the field, and in 113 days, with one or two battles, we conquered a great nation in the cause of humanity. It is in this same cause of humanity, gentlemen, that I understand you are engaged in, looking after the welfare of the people. The services rendered by the Board of Health, and all those who are interested with you, are for humanity and humanity's sake.

We have many other things to be thankful for. We have had no epidemics, and even the smallpox, which has been scattered over the State, has been so mild that many people said it was only chickenpox. Let it be that or whatever it may be, the State Board of Health has been watchful and the Municipal Boards have acted faithfully and they have prevented the spread of it through the country. We should be thankful that the treatment of these diseases has been so much improved and that these diseases are lighter in their effects. To you, gentlemen, belongs much of the credit for this improvement.

I welcome you to this convention, and I know your deliberations will prevent the spread of disease. Your discussions will lead to the improvements of the towns and cities.

While you are discussing the various matters, do not forget to discuss plans for the improvement of the water supplies in our larger cities. They certainly need it. Here in the Capital City of Columbus, they need many things, but if anyone were to ask me what they most needed, I would say, an abundant supply of pure water. [Applause.] I hope, during the next year, much may be done to furnish the people of Columbus with the pure water so much needed. I trust our Board of Health will give attention to another matter here in Columbus, and that is the matter of sewerage system. This has been improved, but it needs more attention.

There have been many things to encourage us as a people, during the past year. The balance of trade has been greatly in our favor in this country. Our exports have been 633 million more than our imports. One billion, two hundred and fifty-four thousand of exports have been recorded—a result which has only been noticed in one or two years before. The earth has yielded the harvest in abundance; the merchant has been able to increase his profits, and to the prosperous man it looks as if the year we are just entering would be his most prosperous one. In order that we may prosper, we must take such a stand as will bring all good things to us. You are devoted to the health of the people and if you protect the health of man, you protect the best thing he has got. There is nothing so valuable to the people as good health.

I congratulate you on the good work you have done. Some people have said that the State Board of Health did not amount to very much, but I have been in a position to see that their work has amounted to a great deal for the people. Much good for the health of our State has been done.

Gentlemen, I most cordially welcome you, and I shall expect to learn something from my meeting with you, although you have not learned much from me. I wish you abundant blessings and a full share of prosperity. May you have good health and be blessed in your families. It will give me great pleasure if I am called upon to give you another welcome, but you must have it a little earlier in January to accomodate my term of office.

Gentlemen, I thank you for your attention, and I hope that we will meet on some other occasion.

Dr. Kahle, President, responded as follows:

On behalf of this convention of the State and local boards of health, I desire to thank your Excellency for the kind words of welcome extended to us on this, our ninth annual meeting, in our State Capital.

I am sure that our deliberations will be more pleasant, and we will each feel a deeper interest in our work, not only during this meeting, but during our labors in our different spheres in the various parts of our State, owing to the cordial greeting accorded to us by your Excellency, Governor of this great State.

We have here represented the sanitary interest of the State—representatives of our large cities and the townships as well, and so complete is the organization that there is not a township in the State that does not have a board of health. We have in the State 637 city and village, and 1,357 township boards of health, a total of 1,994 in the State; and it is with a feeling akin to pride that we refer to the work that has been done by these boards of health.

It is said by good authority that during the last 10 years consumption has decreased 10 per cent., and I feel warranted to say that this is due in no small part to the sanitarians and boards of health.

The work placed upon the State Board of Health by the Legislature, requiring their approval of sources of water supply and sewerage plans, has required a great deal of work.

Most of the large streams and some of the smaller ones are used as water supplies by the different cities and villages situated on their banks, and they are all used for the discharge of sewage. A systematic study of stream pollution in the State was commenced in 1897. Owing to the limited appropriation it was deemed expedient by the State board that three or four streams should be investigated each year. So in 1897 the board took up the Scioto, Olentangy and Mahoning rivers. Chemical and bacterial examinations and measurements of the flow were made at different points along their course at frequent intervals, especially above and below cities that emptied their sewage into them, a complete report of which has been made. This last year (1898) the Maumee and Sandusky rivers were taken up, and for the first time the chemical and bacterial examinations were made in our own laboratory.

At the last session of the Legislature a bill was passed requiring the State Board of Health to establish a laboratory, which has been done, and about the first of June this laboratory was opened with a first-class chemist and bacteriologist in charge, and a very large and an increasing amount of work has been done since that date. It is proposed to make chemical and bacterial examinations free to the local boards of health and public institutions under certain restrictions. The laboratory is prepared to make bacterial examinations for tuberculosis, typhoid fever, anthrax and diphtheria at short notice, and retainers for mailing these substances are sent on application.

This department of the State government has been of recent origin and rapid growth, and we believe that in no other department have the returns been so large and satisfactory, and results more beneficent for the amount of appropriation.

Again, your Excellency, let me assure you of our appreciation of your generous words of welcome, and your presence at this meeting.

THE POSSIBILITIES AND IMPOSSIBILITIES OF STATE MEDICINE.

BY DR. DAN MILLIKIN, OF HAMILTON, OHIO.

Asked to prepare a paper on the above title for your meeting, I confess that I am almost overwhelmed by the importance of the subject. For your boards deal with a matter which is second to none in importance. I justify this remark by the truth which has passed into many proverbs, that if you have health you can get all else that you need; and if you have not health you cannot be profited by the wealth of the world. So that, if we say nothing of death, but limit our view to the subject of preventable disease, we will find that we are dealing with a subject of transcendent importance from the economic and the sentimental standpoint alike.

If I say that under the existing laws (reinforced possibly by some additional enactments that may be found necessary) your boards of health have the power to wipe out all epidemic diseases, or to greatly limit them, I make a statement which alone would almost justify this. For that is equivalent to saying that you have the power and the ability to save to the people of your State an amount which far exceeds all production of farm and factory. Ask yourselves how many people of this State are sick at this time; in particular, ask how many are needlessly sick; ask how many are sick from preventable diseases; ask the amount of wages they lose; ask the value of their medical attendance and medicines; sum up the incidental expenses which accompany all sickness; note the enormous loss of time suffered by those who wait upon the sick; add to this the lassitude and unproductiveness which belong to convalescence; observe that in a great many cases an independent and thrifty family is often reduced to permanent pauperism by sickness, the artisan is reduced to the rank of a coarse laborer, the farmer goes into debt and presently becomes a "renter," the renter loses his team and his tools and becomes a laborer; add to all the funeral expenses in case of death; and, when all these sums have been aggregated into one frightful total, confess that there are no economic problems more important than those with which you deal.

Returning to the one item of medical attendance, let me say to you that in this State alone there are at this time upward of 10,000 doctors who are busy, according to their gifts, in administering to the wants of the sick. I might pause to praise the quality of their work and to say that it is the outcome, the very flower, of the highest civilization and culture, but it is my present purpose to suggest to you rather that these doctors are doing work which is at least one-half superfluous. I may say that they only contribute to the gross wealth of the State by saving some little time for a small fraction of their patients; and that, for the most part, the enormous incomes of the medical profession indicate attendance upon persons who should not have been sick at all, and who, in many cases, are ill because of the fault of their neighbors, or of the State, or of some municipality, or the grievous fault of some board of health.

Take, if you please, the shameful state of affairs in Cincinnati as an exemplification of this. Cincinnati is never free from typhoid fever. Its inhabitants drink typhoid fever, and it is safe to say, as a cold, scientific statement, that all persons who live in that city and do not have typhoid fever are either naturally insusceptible or have become immune by passing through a perilous attack of the disease. Cincinnati has had in some years as many as 600 cases of typhoid fever at one time, and this number has been maintained for weeks by the sickness of new cases to take the places of convalescents. At some of her institutions of learning ten per cent. of the students from abroad were attacked by the disease each winter. Measured by any standard which civilized men would accept, the loss of time and ease and precious lives in that one city, during the past 20 years, far exceeds the loss of life and time and the gross amount of suffering in Crete, Armenia and Cuba all combined. For this some one is to blame; for the general apathy all are to blame. In Cincinnati, as elsewhere, every case of typhoid fever is a case of manslaughter; and when I say to you that all of this disease is due to the drinking of ditch water, pumped from the Ohio river and distributed through the city's water mains, you will agree with me that the enormous sums paid to the physicians of Cincinnati for fighting with this preventable and avoidable disease, is so much money wasted.

So here are the rich and wonderful possibilites for you. If by any means you can diminish, and still more if you can absolutely interrupt these preventable diseases you are doing a work which appears most highly conservative of all that the sentimentalist and the economist deem precious.

Perhaps at this point a word may be fitly spoken of the enormous powers given to boards of health and their agents. We are accustomed to say, in a phrase, which I believe is borrowed from the common law, that a man's house is his castle; but when the health officer comes about the premises the householder finds that he is a very small man. I pretend that I can do what I please with mine own; but I don't do what I please with mine own if the health officer knows it. Death enters my house and the health officer, if he sees fit, tells me that I shall not bury my dead as I please; he forbids my friends and kindred to come to weep or to show sympathy; he curtails my funeral pageant; he orders the interment to take place within so many hours. "No man's pie is free from his ambitious finger." He is for the time a greater man than Kaiser or Czar.

And I have to say that nothing so surprises me in our current aud local history as the endurance of this sort of regulation and interference by the American people. For there is something in our blood which forbids coercion, restraint, or even regulation by government. It is not wholly due to the admixture of that Celtic blood which sets the Irishman instinctively *agin the guvermint,* for our English cousins have had the same tendency to limit the powers of government in favor of great personal liberty. They yield, *we* yield to the will of the majority in great matters, but they will not be coerced into uniformity in the minutiae of life; they are stubborn as to small affairs they will not endure sumptuary laws; they will not be Prussianized. For freedom, personal freedom, they have clipt the king's prerogatives, they have clipt off kings' heads, they have crossed seas and shed dear blood, and have faced savages and famine and inhospitable climate, and they will surrender nothing to the special scientific wisdom of the few.

But when general knowledge comes to a community it is patient and submissive to hygienic regulations with an obedience which is better than the passive obedience of slaves. And so I say to you that your best work will not be done when you execute wise laws pertaining to public health; your best work will be done by the breeding of sound and wise knowledge among the common people. In very truth, all good work in the social machine is so accomplished. Statutes themselves are only the deliberate public opinion crystalized into a formal expression and definite shape; and if the statutes came directly from the people, they would constitute the last word. But, as a matter of fact, they do not come directly from the people, but from the people's representatives, who are sometimes in advance of the general public knowledge, sometimes far in the rear and sometimes mysteriously diverse from it. It may sometimes be your great privilege to bring the good people up to the level of information which has been attained by legislators, to so manage the good people, your neighbors, that they shall seem to manage themselves.

This involves a certain superior knowledge on the part of boards of health. They can neither do good executive work, nor missionary work, unless they are themselves full of knowledge. The confidence and the respect of the average citizen with whom you deal will depend upon this. And it should never be forgotten that the people most cheerfully go with you in the execution of any measure which involves the yielding of private rights for public good. It is a pity if the board of health shall not know something of health and disease, and that knowledge can be in great degree attained by the study of the right sort of treatises on the subject.

I submit to you the truth, that laws made in Columbus must have a local ratification to be effective in the remoter corners of the State. This is true in all matters. Sooner or later the laws must conform to public opinion, or be repealed, or go into the category of dead letter laws which no one enforces, or obeys, or even quotes. Particularly is this true of laws which bear upon health and domiciliary arrangements and personal conduct; for these are matters which especially touch personal liberty. There is an instinct which bids man to do as he pleases with himself and his house. It is savage, to be sure, and it indicates a certain anarchistic tendency not yet wholly bred out of man. But it is a biologic factor; it is a condition under which you must do your beneficent work.

Let us have some concrete examples. He would be a foolish explorer who would essay the mighty task of wresting the secrets of the pole, and who would to that end live among the Esquimaux, and would there lead a crusade against the Esquimaux habit of utilizing urine as a detergent fluid. The enlightened Esquimaux would tell the hygienic crusader that he has no other fluid at hand; that his hut is always below the freezing point of water, and that all the water that he melts for cooking purposes is melted by the combustion of precious oil and blubber which is available for food. There are, I believe, no terms in the Esquimaux tongue in which one might plainly tell the simple inhabitants of the frozen north that the excreted and dissolved products of retrograde metamorphosis are exceedingly poisonous, and are reckoned as filthy and indecent stuff by the refined inhabitants of Paris, and Boston, and Hamilton. What cares he of these chemicals, or of these great centers of southern refinement and culture? He knows that he must wash his face on state occasions, and his wife knows that she must wash the baby sometimes, even in an ice hut at a temperature below freezing, and they do wash after the manner of their fathers and mothers. No board of health can be imagined with powers sufficient to put a stop to this filthy habit, which has its roots in climatic conditions and is maintained by custom, which no man can break so long as the Esquimaux live in their gloomy and ice-bound home. Even in high latitudes local public opinion must rule and will rule.

Or come into the lower latitudes where the climate permits more refinement and elegance of manner; take a rustic community in our own State, and observe the prodigious amount of expectoration that is going on. Pass a law forbidding this vile habit and attempt to enforce it and see where you come out. The rustic spits to assert himself; he spits because he is embarrassed; he spits because he has the fixed habit of spitting; he spits on everything about him to assert his personal liberty; and he does all the more vehemently because there are ordinances against it.

Now I know that saliva is said to contain many morbific germs, and I also know that it may contain the germs of tuberculosis, the scourge of civilization; but the spitting creature does not know this, and he is not willing to restrain himself upon my special knowledge. And I am free to say that I do not think that laws can possibly suppress the free dispensation of saliva in any given community until the knowledge is widespread that saliva is not clean water as many suppose, that it is decomposable, and that it may be dangerous.

After all your efforts there will be many things that you cannot accomplish. Nothing is more obvious to a thinking man than that the use of large quantities of tea, coffee, tobacco and alcohol is very injurious to the average citizen. But laws have never yet efficiently regulated the indigestion of any one of these poisons, and it is certain that laws never will regulate their use until the people come to know what is deleterious.

Even in the matter of water supply, it will be impossible for you to check the most evident abuses unless those abuses are recognized by the people as such. I have knowledge of a well which is dug into the deep alluvium immediately beside a river. It has its historic associations, because it was once within the limits of a pioneer fort. About the fort grew up a large town. The oldest and most densely populated block lies on higher ground than this well and immediately adjacent. The old privy vaults have contaminated the gravel between them and the old well for 100 years. With every rise and fall of the river the water rises and falls in the well and in the vaults near by. No person of ordinary brains will deny that this constant oscillation must give rise to transverse travel of well water and filth alike, so that there is an approach to uniformity in all the fluids in this subsoil. These facts are very patent and they have been made very plain to the community. Yet the water *tastes good* on account of its high percentage of chlorides, and through the live-long day the working people from near and far run to this well with their buckets for its unmatched supply of water. The well, in truth, ought to be closed, but to close it now would certainly invite an injunction suit and it might precipitate a riot.

If we go into the country we will find much the same state of affairs. Again and again we may find the domestic supply of water drawn from a source where it might easily be contaminated by a pond of stock water dammed up in a ravine, or from a spring which is reinforced by surface waters. To close such wells and springs would be a move in the right direction, yet so far in advance of public opinion that it would seem harsh and irrational.

Or take a more extreme case. I do not suppose that anyone who will seriously contemplate the possibilities of paved streets and horseless carriages will doubt that there might now be a city founded wherein an ordinance should prevail that no horse or other large quadruped should enter within its corporate limits, and that ordinance would work for the health and the economic living of all citizens. Such is the evil of wading in city mud, which consists in a large degree of horse excrement; such is the expense and danger of fighting and breathing dust which comes chiefly from the same source; such is the expense of maintaining such large beasts remote from the farm; and such are the demonstrated possibilities of horseless vehicles and moving sidewalks and electric cars that it is clear that the city without horses is the city for health and economic living.

But fancy such a conservative ordinance passed by any city, large or small! What riots would ensue, what injunctions and what damage suits! The time is not ripe; and the lessons of hygiene and engineering must be learned by the people at large, maybe a century hence, before the horseless city will be possible.

And here, I think, is indicated the highest function possible for boards of health. You may think that you are doing your whole duty when you enforce the laws; I think that you will be doing your highest duty when you educate the people to the readiness to formulate, enact and cheerfully obey laws which are not now possible. You are doing well when you conserve public health; you will be doing thrice as good when you cultivate an advanced public opinion.

To that end I think that you ought to give a reason, a good and clear reason, for every restriction you place on trade and visiting, and especially for vaccination, placarding of houses and the like. It is the simplest and best referendum, and I insist that a people like ours is fit to be taken into the confidence of the conservators of public health.

Some one will say, *this man would have the board of health run as a literary department.* I own to the justness of the charge. You cannot even have a community well vaccinated without having the community enlightened. In very truth there is no community well vaccinated in this State at this time, and there will not be until the public is systematically instructed as to the nature of the inoculation, and the historical facts which justify it. Within a short time I have heard an intelligent person say: *I don't believe in vaccination because I don't see how it can do any good in the way of preventing smallpox;* and another said: *What's the use of all this bother about a disease as rare as smallpox?* Another said: *Why smallpox is the most trifling of diseases, isn't it? I see that the mortality is only one per cent.* And many of my patrons and acquaintances have lived in dread of vaccination because of apparently disastrous results they have heard of here and there. Now I have found these good people ripe for some history of the ravages of smallpox in days before Jenner's discovery; I have found them deeply impressed by statements of the mortality of smallpox in certain visitations; I have found them not at all slow to take in the truth that epidemics of other eruptive diseases differ in virulence; I have found them capable of reaching easily some valuable and pregnant generalizations as to the duration of immunity in general.

And so it seems to me that I can make no better suggestions than that you should go to the public as teachers and give them simple tracts which should convey to them information of the nature, the course and the civic treatment of disease.

And certainly you need not dread the name of literature. Your most enlightened farmers are working in accordance with the results of work done at the many agricultural observation and experiment stations, and these results they get either at first or second hand from the literature sent out from those stations. The great scientific work carried on by the government institutions comes to the people in the form of literature. The observations of our consuls come to the people as literature, and they form a popular basis for opinions on trade and markets and prices the world over. Statesmen resort to literature to reach and impress an intelligent clientele who will assist in the propagation of great plans. The great political parties resort to literature for the propagation of principles which are for the time under discussion and which are about to be put to the test of the ballot. The man who has something to sell resorts to an advertisement or a prospectus, which is in the nature of literature, to set forth the merits of his wares or the nature of a proposed investment. So you, with the greates propriety may resort to tracts and treatises for the purpose of spreading hygienic knowledge, explaining the object and the bearing of hygienic laws and regulations, and incidentally making easy your work of conserving the health of the community.

ADDRESS.

BY DR. J. H CANFIELD, PRESIDENT OHIO STATE UNIVERSITY.

President Canfield: *Mr. President and Gentlemen of the Convention* If short talks from the floor are to be the order of the evening I belong on the floor, but unfortunately for myself there happens to be another shortness that compels me to remain on the platform if I expect to be either seen or heard.

I wish to say just this one thing this evening, from the standpoint of a layman: and that is that it is exceedingly necessary that in some way we manage to secure among the people at large a more keen and wide-spread recognition of the place and value of expert knowledge in the affairs in which you are so much interested. In American life heretofore there has been a very general acceptance of the all-around man, and with good reason. The intellectual and physical energy displayed by the American people has been and still is something amazing and without precedent. A hundred years has given us the civilization of cycles of centuries; the material world has yielded to our sway, and all its forces are at our command; all obstacles have been overcome, indeed have proved so slight as to scarcely deserve the name of obstacles; in government, in invention, in production, in all the varied pursuits and interests of life, we have shown ourselves capable of masterful existence. The facility with which the American intellect has taken hold of every question that has presented itself for answer, every problem that has demanded solution, is without any equal in the history of any people.

There is nothing at all like it, unless it be that manifestation of the masterful qualities of the old Norse blood—blood that is without a doubt still in our veins, which marked the period when, in the language of Motley, the Norse Vikings were "seating themselves with gentlemen-like effrontery on every throne in Europe."

But until say 20 years ago, we have been a simple people, with rather simple problems; a scattered people without the perplexities that come within urban life; a somewhat homogenous people rather than of a decidedly mixed blood; and our knowledge of the physical world, though reasonably sufficient, has been limited. The times have changed, however, and we change with them. The saying is old enough, but the truth is as old as humanity itself. And with every change come new conditions and new demands. The fashion of this winter is not that of last, as some of us know to our discontent and possibly slight mortification—for our pocketbook is more apt to be as scant as last year's top-coat than as full as this winter's skirts. The canal boat was an advance upon the then prevalent methods of travel, but the steam car quickly and far outran it. The bobtail mule car was better than the 'bus, but the electric car is better than either. The mounted mail carrier, who stopped by the roadside and let his patrons sort over the mail till they found their own, was once a welcome figure upon the country roads; but the swift-fingered route agent, on the flying express, tells of a new age and new possibilities; only satisfied, hardly satified, with the telegraph and the telephone. With each advance comes the demand for more knowledge and more accurate knowledge—training and experience which constantly tend to specialization, which cost more time and greater effort, which are possible to a comparatively limited number of people, but which are worth more to the world, in every sense of the word. The nature of this training and experience is such as to practically preclude entering upon a very wide field, but the result is the ability to render a service the value of which very closely approximates the restriction, and is very accurately measured by it. The real genius involved in the work of canal building is scarcely to be compared with that which constructs the steam engine or which marks out the path which it is to follow. There was very little special information or preparation needed to put in operation the mule car—only some harness and a whip—but the advent of the trolley car was dependent upon a very high order of training. Franklin, with the shrewdness that marks him as both a great and a typical American, laid the foundation of the present mail service; but Franklin would need a full century of experience to be an acceptable postmaster-general to-day.

We all see this and feel it, so far as our own particular work is concerned; and especially in what is called the more practical work of life—in some of the special forms of business and in the higher professions. But it is hard for us to recognize this quality in other people, and especially hard for us to recognize this along what might be called liberal or mental lines like general sanitation, in which the whole people still very generally feel that they have quite sufficient knowledge to meet all the exigencies of the case. You can see some illustrations of what I mean in the change of popular sentiment with regard to government. For many years after the adoption of the Constitution there had been an intuitive and instinctive respect on the part of the many for the opinions and decisions of the few; the few who were the true *aristoi*, the best of their kind. well fitted for leadership, having expert knowledge of public affairs, and largely if not entirely deserving the almost unlimited confidence which was so freely and so generally accorded them, and which was so rarely betrayed. But the pendulum must swing, and in Jackson's administration we passed to almost equal distrust of all leadership and the enthronement of individualism. There was a feeling that there was wisdom enough in the people at large to manage national affairs, and wisdom enough in each locality to manage local affairs. This has been the drift of popular feeling to this day, and it has not been without its value, in educating the people by responsibility. But the time has come in which there is a very clear recognition by many of us that there is much expert knowledge that simply cannot be shared by the people at large. There is much that must be taken on faith, faith in personal character and personal attainments. We are not always willing to manifest this faith. When the housemaid takes the liberty to differ with my wife on matters domestic, I take her side of course—my wife's side I mean, and I marvel at the audacity which puts inexperience and lack of training against all that is otherwise, and other and wise. When a member of my Board of Trustees opposes any portion of my administrative policy, I cannot understand how he can think for a moment of such a course, when he is only a good business man, while I am both a good business man and an educational expert—I speak after the manner of men and for illustrative purposes only, and not as to facts! But, bless you, when the army is in front of Santiago I conduct the campaign in a way that is infinitively superior to the crude methods and negligent manner of the administration at Washington. I am astounded at the unwisdom of the highest naval officers, and denounce bitterly the doings or the misdoings of the Secretary of War. And if it happens to be true that I cannot shoulder my crutch and show how battles are won, I can at least grasp my pen and write columns of stuff for the most jaundiced of journals.

What is necessary to correct is this, where possible, a more complete knowledge of all the facts: and whether this can be secured or not, the backward swing of the pendulum, away from crass individualism, not to a blind or instinctive acceptance of dictation, but to be a wise and intelligent and wide-eyed choice of competent leaders.

Like all object lessons, the first method is the best, though doubtless the least available. Just as comparatively few people can learn geography by extended travel, so a mastery of all the conditions and details of all phases of life is impossible to the many. But this sort of conversation is not opportune to all nor to many, and so with the many there must be a greater willingness to accept the judgment of others. Now as to the judgment of others, is it not true that if I desire to learn something of theology I go to a minister and not to a soap-maker. If I wish to learn the processes of soap-making I go to a manufacturer and not to a theologian. If I desire to understand the stock market, I go to a broker or to a banker, and not to my tailor; and it never occurs to me to ask my butcher about the fall style of neckwear. But if I wish to know something of the methods of raising revenues in this country, and to the effect of that method upon production in America, I do not go to Adams, or Sumner, or Walker, or Perry, or Bowker, or Wells—Oh, no! I go to the editor of the *Podunk Weekly Clarion*, who knows all about it, and not only knows all about it, but freely and openly admits that he knows all about it, and who is not only ready but only too often is willing and able—the more's the pity—to read out of the party men who do not happen to agree with what he happened to say last week: which he may never say again, or the contrary of which he is very likely to say next week—but that does not matter. And so we do not willingly follow the plan adopted in China. There the physician is hired to keep the family in good health; and when any member of the family falls ill, his pay stops. Our people feel that they are sufficiently intelligent to take care of themselves in all matters of general sanitation. And so it is that when they fancy themselves ill they will not call in a physician, but will "dope" themselves with all manner of concoctions—that is what gives the extensive sale to patent medicines. Again they claim that you gentlemen who are health officers make unreasonable demands and ask for extraordinary care and trouble where none is needed; and hence they throw their slops out on the ground near their wells, and leave their cellars full of decaying vegetable matter, and this is what gives us our epidemics. These characteristics, which we sometimes call a spirit of independence, but which after all is very stupid and very short-sighted obstinacy, forms the chief difficulty in enforcing quarantine and in securing a faithful performance of ordinary and extraordinary sanitary laws. I have no desire to say any thing against the reasonable independence of American citizens. I believe in the people, thoroughly and heartily; but to-night my plea to you, gentlemen, is that you devise some way by which your own expert knowledge shall be better appreciated. I am perfectly willing to admit that unquestionably we are partly to blame for this lack of appreciation, this unwillingness to accept expert opinion, because of no little foolishness on our part, and because of some very greatly exaggerated statements which have been made under the head of "expert opinion" and "specialization." There is scarcely a day passes that some one does not read a paper, prepared at great length, upon a question that is of no particular interest to any one, and a question treated with no particular ability or skill. There is a vast amount of stuff, pure and unalloyed stuff, given out to the world under the head of expert knowledge. It is a pity that this cannot be in the hands of a commission, to determine whether such work is really worth doing, either "originally" or subsequently. I am perfectly willing to admit, and I do gladly admit, the great value to all of us of the really remarkable work that has been done in lines of medicine and surgery and sanitation in the last 20 years; yet I cannot help recalling the fact that a gentleman high in your profession recently remarked to me that if he had the editing of the medical journals of this country he would publish not to exceed one-third of the matter that appears in them, and a good deal of that with some doubts.

The simple fact is, gentlemen, that the value of expert knowledge—I mean the practical, applied value of it—seems to depend largely, if not entirely, upon the faith which the people have in it; and this faith again depends very largely upon the character, the equipment, and the integrity of those who are putting fourth this expert knowledge to the world. Just as soon as you can inspire that kind of faith, you will move forward rapidly to the victory over the diseases that afflict all mankind. Just how you will go about this is a hard matter to be determined. I think you will gain something if you will raise the standards in the institutions in which you have been educated. Physicians are not yet overeducated! You will accomplish a great deal if you will put the standard of training higher than it is to-day. There was a time when the foundation work seemed not so necessary as it does to-day. There was a time when the common school (we spoke of the district school then as the poor man's college) was sufficient. But that day has gone by. The young men who are to practice medicine to-day must be better trained than they were fifty years ago. Think how we have enlarged all fields of work. A single illustration. Twenty years ago we established the work of electrical engineering. We had a four years' course, based on a good high school training, and believed that would take students over the ground. To-day everybody knows it is absolutely necessary to have five years, because of so much larger knowledge of natural forces. As your horizon has expanded, you must lift yourselves higher from the ground. You must stand above your predecessors, if you are to be seen. If this can be done in a more scientific way than it is done to-day, if we can accomplish this, then I feel there will be a greater confidence in you on the part of the community. You need good legislation. You need good State officers who shall take up this work. But you yourselves need to march at the head of the column. We are trying to do something at the university this winter by a course of lectures, but this is only a drop in the bucket. It is not an easy matter to increase general intelligence. It means hard work. And, on your part, every time you take up the study of this matter, you will see new fields to be investigated and new openings to be explored. This will certainly be true if you are absorbed in your work, if you love it. It was nothing extraordinary when that boy said, "I don't see why they say love is blind! I can see ten times as much in my girl as any member of my family does." He who takes this loving work to his own town or community is the man who will walk with increased stature and with increased strength among his fellow men. For such success so won in your chosen field of work I give you my hearty commendation and a layman's benediction.

THIRD SESSION.

The third session of the meeting of the State and Local Boards of Health was called to order at 8:30 on Friday morning, January 20, 1899.

The President—I have the pleasure of introducing to you this morning Mr. E. G. Horton, who will read a paper on "The Laboratory in Sanitary Work."

THE LABORATORY IN SANITARY WORK.

By E. G. Horton, B. S., Bacteriologist and Chemist of the Ohio State Board of Health.

Nearly 400 years ago a ship might have been seen sailing in and out among the Bahama Islands, and then proceeding to the coast of Florida. The commander of this vessel was Ponce de Leon, an old man, who sought in this newly discovered land that which he had been informed existed here—a miraculous fountain in whose waters one might bathe and regain for all time the power and vigor of youth. The search was unsuccessful, and death finally claimed the unhappy old man.

In four centuries many changes have come to this country, but this meeting to-day is the outcome of motives not entirely like those of de Leon. To be sure, the idea of finding a fountain of perpetual youth has long since been abandoned, while now we seek the means of preserving the health of our people for the few years of existence granted them on earth.

In the endeavor to protect the health of communities and individuals there has been invoked the aid of scientific workshops, the so-called laboratories, whose origin and work it is our purpose to discuss at this time. The belief in some mysterious agency by which health and happiness should come, did not have its origin in the time of de Leon, for we find it in connection with the earliest work in chemistry. The chymis, as he was then called, divided his time between striving to make silver and gold out of the baser metals, and seeking to obtain an elixir of immortal health by the distillation of the juices of vegetable substances. For several centuries early chemistry struggled under a stigma of contemptuous trickery, which prevailed until the Sixteenth century, when medicine and chemistry joined hands for mutual improvement. There is no longer any hovering cloud of disrepute, for uncertainty has become certainty, and a science has now developed capable of penetrating the depths of hitherto unsolved problems, and doing this with such accuracy of result that one must concede a large degreee of admiration and respect to the power of such a science.

The field of applied chemistry is a large one, and is continually increasing. The foundation stone of practical sanitation was securely laid when the applianees of chemistry were brought to bear upon health problems.

Two forces have been at work to bring about the laboratory. One of these is educational, and arose originally in connection with museums through the need of a workshop for the preparation and repair of specimens. At first these workrooms were dingy, close and poorly lighted, yet necessity kept them and fostered their progress until the demands were beyond the personal resources of the museum professor, and the institution was called upon to take charge of the equipment. Slow in starting, the real development of the laboratory has occurred within the limits of the present century. Beginning with those founded by Thomson at Glasgow, and Liebig at Dresden, others followed rapidly, until now they are found in nearly every educational institution.

The other force which has been active in producing the modern laboratory had its origin in the need of a place in which to solve certain practical problems. Thus arose the laboratory of investigation.

While chemistry furnished the basis for the early sanitary work, there has been evolved during the last generation a sister science by whose help new fields have been opened to the sanitarian. Bacteriology is young, but in a few years has made great advances. No small share of its success is due to the early labors of Louis Pasteur. Let us consider for a few moments a few of the problems mastered by this pioneer in the field of those minute, living particles known as micro-organisms.

Of great importance and far reaching in their results were his studies on fermentation, wines, silk worms and anthrax. One fermentation after another was taken up, studied, and found to result from the activity of some micro-organism. The relation of the yeast cell to alcoholic fermentation was fully explained. His work upon wines and beers is very interesting. Pasteur boiled several flasks of grape juice to destroy the organisms present, then divided the flasks into four groups. The flasks of the first group were set aside, and no change occurred in them. To the flasks of the second group he added the washings from a bunch of grapes, with the result that alcoholic fermentation took place in 48 hours. To the flasks of the third group he likewise added some of the washings from the same bunch of grapes with this difference, he boiled the washings before adding. No change resulted. To the fourth group he added some juice taken with precaution from the interior of sound grapes, so as to exclude nothing from the exterior. No change occurred. These experiments disposed of all other theories by showing the impossibility of fermenting the juice aside from the dust on the surface of the grapes and woody peduncles. In this dust were the yeast cells which caused the fermentation.

Previous to the time of Pasteur, beers and wines had repeatedly spoiled, and no one had been able to determine the cause. This painstaking worker found the cause and cure for each malady, with the result that great changes were made in the process of making and handling beers and wines. There had been heavy losses among red wines but these ceased when it was found that the evil effects were missing, provided the wine was heated above 55 degrees C. (122 degrees F.). Additional value is given these results obtained in Pasteur's laboratory when we consider that the outcome has been our present valuable methods of disinfection and sterilization by means of heat.

In the light of bacteriological methods now in vogue, we turn with deep interest to the pioneer work on infectious parasitic diseases. Pollender and Davaine had discovered minute rod-like forms in the blood of sheep, dead from splenic fever. Davaine had caused the death of other animals by introducing some of this blood into their bodies, but it remained for Pasteur to isolate the specific germ, cultivate it on artificial media, and produce typical anthrax by the inoculation of animals with pure cultures. By laboratory methods Pasteur was able to decrease the virulence of anthrax, *i. e.*, attenuate it until inoculations were followed by slight illness only, and the animal became immune to subsequent attacks from virulent infections. Pasteur made a public demonstration by inoculating 50 sheep and a few cows with virulent anthrax, one-half of the animals having been previously immunized by means of attenuated cultures. Three days later the people reassembled to see the result. All the immunized animals were in "full health and gayety." Of the animals not previously immunized, 21 sheep were dead and the other four were dying of anthrax; the cows showed tumors, high fever and loss of appetite. Little wonder a shout went up from the people approving the success of the trial.

We will refer to another work simply to show the financial bearing of the result. The silk worm industry of France was nearly ruined by the disease among the worms known as pèbrine. Pasteur traced the disease to its origin and found a method of stamping it out. In order to demonstrate the success of the work the Emperor of France placed at Pasteur's disposal a villa which had been run at a loss for several years owing to pèbrine. A little later the sale of cocoons from this same villa gave a net profit of 26,000,000 francs, or about $5,000,000.

The difficulties through which Pasteur struggled to attain these results are not seen at a glance. The details of these experiments have not been pointed out, yet it is the handling of these very details successfully or otherwise which makes or mars the work of the laboratory. In the laboratory the manipulator is able to bring to bear certain factors to the exclusion of others, and thus establish fully the exact relation between the various agencies involved. To one not familiar with the technique, there is but a faint conception of the importance of dealing most carefully with the minutest details in order to insure reliability of results. It seems hard for some people to realize that specimens must be collected and shipped under certain precautions, and, accordingly striking examples of thoughtlessness are frequently found. These persons do not take cognizance of the fact that a chemist or bacteriologist in making an analysis is not able to distinguish between the impurities originally in the sample, and the impurities introduced into that sample by virtue of its being enclosed in a dirty bottle. Thus an excellent water might be condemned through no fault of its own, but because of the lack of cleanliness in the container. It is for this reason that most laboratories now use their own containers for the shipment of samples. These containers are tested before they leave the laboratory, and their use, together with a strict compliance with the instructions for collecting shipping, secures an honest sample with little probability of error. It is true that laboratory workers are frequently thought oldmaidish and cranky because of their refusal to accept samples of which they know nothing of the method of collection and shipment. In defense, let me quote from one of my note books a single instance, and you may judge whether the position is well taken.

Two bacteriological analyses were made of the same water, three days apart. The first sample of the water was brought in a beer bottle. It was accepted, but at the same time a request was made for a sample to be collected in one of the laboratory bottles. The first sample showed 23,550 bacteria per cubic centimeter, while the second contained but 25 bacteria to the cubic centimeter. The dirty beer bottle had increased the number of microbes nearly 1,000 fold. You may think this sample came from some out-of-the-way nook, into whose dark recesses even the first rays of intelligence had failed to penetrate. Well, the sample came from the country residence of a gentleman who stands high in the ranks of American educators. Of course this did not occur in the State of Ohio, but—

Judging from what some of you have said at various times, I believe the life of the average health officer is not all happiness—that his pathway is not always strewn with roses. If then this unfortunate person receive upbraidings, and perhaps cursings for the strict compliance with duty, what ought he or what would he receive from his fellow townsmen, if by carelessness he sends an unfair sample and its condemnation work hardships to the people of his community? My point is this—should you have any occasion to send samples to this laboratory, please follow implicitly the instruetions which will be given you by the State Board of Health, and then—continue to be just as happy as you can.

The use of the laboratory for strictly sanitary purposes is a comparatively recent move, as it was but 28 years ago this month that Dr. Fleck founded in Dresden the first laboratory for the investigation of sanitary chemistry. The work was chiefly the study of methods of food and water analysis, and the influence of arsenical wall papers. Little more than a single decade ago there was no laboratory in any state or municipality of this country where analyses could be obtained free or upon payment of a small fee. It is a pleasure to say that the initiative on this side of the ocean was taken by a State Board of Health. In Chapter 274 of the Laws of Massachusetts, 1886, we find permission given the State Board of Health to establish a laboratory. All credit is due the Massachusetts board for their efforts. Let us not stint our praise of them for they have been the early settlers clearing the way that others may follow. That board has led and does lead to-day in sanitary work. They are worthy of emulation. They have at present four laboratories and make partial use of a fifth one. The five other states maintaining their own laboratories, in which various analytical examinations are made, are Minnesota, New Jersey, Washington, Vermont and Ohio, the last two establishing their equipment during 1898. The appropriation in Vermont is worthy of comment as suggestive of progress. The Legislature gave the Vermont State Board of Health $5,000 with which to equip a laboratory and $8,000 annnally to maintain it. Well done, little Vermont. Maryland sustains a laboratory in connection with the city of Baltimore. Wisconsin has a small bacteriological laboratory, while New York has a chemical one. The statements we have received from other states show that at least 10 of them, while having no laboratories of their own, secure certain of the advantages through private parties or educational institutions by paying for the work by the piece. The balance of the states, comprising far more than half, have no State Board of Health, or do no laboratory work, or do so little of it that it counts for nothing. Why? Not because of any unwillingness on the part of the State boards, but simply because they are hampered by lack of funds. Our Canadian brethren have pressed forward faster than we have, as only one of their six provincial boards is doing no analytical work, while at least three have their own laboratories.

Briefly we will refer to a few of the more prominent phases of the work as it is being carried on in sanitary laboratories. In some places the only line of work attempted is the determination of the sanitary value of drinking waters by means of a chemical analysis, and probably no other line is so universally practiced.

Next in frequency of occurrence comes the bacteriological examination of specimens from suspected cases of tuberculosis and diphtheria. In pulmonary tuberculosis the examination is made from the sputum by means of microscopic inspection of the bacilli after a process of differential staining. In diphtheria the high infectiousness, the rapid development and the fatality of the disease makes an early diagnosis extremely desirable. The examination is made by inspection of stained preparations and by cultivation of the germs. The usual practice in collecting the specimen is to rub a sterile swab over the affected area. Then a tube of blood serum may or may not be used by smearing the swab lightly over the surface of the serum. No phase of laboratory work demands greater care than the collection and manipulation of diphtheria specimens, yet, nowhere do we find so frequent interference with the examination resulting from the failure to follow directions. From a bacteriological point the mouth is a filthy place, swarming with microbes of many kinds. Accidental contact with the tongue, teeth, or roof of the mouth may load the swab with such a mass of micro-organism as to preclude the finding of the few diphtheria bacilli present. A patient may have a very mild attack, or the diphtheria germs may be few in number, still, safety lies only in treating the case as a menace to the health of those persons with whom the patient comes in contact and through them the community at large. We cannot—dare not say that the transmission of a single diphtheria bacillus from that mild case may not result in virulent diphtheria and death in a subsequent case.

The bacteriological examination of water both as to number and nature of the organisms present is another common phase of the work. It is now universally accepted that typhoid fever is generally a water-bourne disease and thus especial emphasis is added to the otherwise desirable investigation of the microscopic life in waters.

Occasionally typhoid fever so closely simulates other low fevers that the diagnosis is doubtful, yet desirable because of the liability of infection to others. The Widal test enables the diagnosis in the large percentage of cases to be correctly made from a drop of the patient's blood.

With most persons, rabies is a much dreaded disease, and as preventive measures have been so successful, a diagnosis of all suspected case of rabies should be made by the inoculation of rabbits with portions from the brain or spinal cord of the suspected animal.

While anthrax is quite rare in our domestic animals and glanders is not common, yet they do occur and are transmissable to man. It is not a difficult matter to establish the identity of these diseases from proper specimens.

Many communities obtain their water supply from some river and in turn empty their sewage into the river. The study of the amount of pollution and purification of river waters is a proper sanitary measure capable of fulfillment in the laboratory.

Much has been done while much remains to be done upon the efficiency and best methods of use of the various antiseptic and disinfecting agents.

The adulteration of food like that of milk properly comes under the jurisdiction of the Dairy and Food Commissioner, but the examination of foods suspected of causing disease is legitimately the work of Boards of Health. Under this head are tuberculous and trichinous meats. With proper samples the recognition of these offers no great difficulty.

The chemical side of the milk question has been looked after to some extent by municipal authorities, but almost nothing has been done bacteriologically. As milk is a most excellent medium for the sustenance and propagation of bacteria, and as it is open to marked pollution by the too frequently dirty methods of dairymen and milk-dealers there results a condition in milk which is startling when one preceives the figures. Sedgwick and Batchelder found the milk sold in the city of Boston to contain from 30,000 to 4,000,000 bacteria per cubic centimeter. Watson and Loveland found the milk of Middletown, Conn., containing as high as 85,000,000 germs per cubic centimeter. It is not uncommon to find 5,000,000 bacteria in a cubic centimeter of milk sold in cities. Dr. Bleile in 1897 found in five tests an average of 136,340 bacteria per cubic centimeter in the Alliance sewage. These thoughts may not leave a savory taste in our mouths when we realize that these milks are often vastly richer in bacterial life than is the sewage of our large cities. With an annual consumption of upwards of 5,200,000,000 gallons of milk in the United States, with an occurrence of the tubercle bacillus in milk that is surprising, with the liability of infection from typhoid fever and diphtheria germs, we feel that more stringent measures should prevail regarding the bacteriological examination of milk supplies.

From the paper given yesterday by Dr. Crossland you learned of ice pollution, and when it frequently takes six figures to express the number of microbes in a teaspoonful of melted ice, it is high time that we entertain the feeling that the public health can be improved by the inspection and examination of ice supplies.

It is readily seen from the brief foregoing outline that the work is of immeasureable value in the restoration and preservation of health, and in the prevention of disease. Likewise the fact stands out that this work can be successfully carried out only in laboratories and by specially trained men. A practicing physician has not the time, the apparatus, nor in general the training to do the work. The people are slowly awakening from their dangerous lethargy, and, as a result, laboratories are being slowly and gingerly established in State and municipality. Of course there are private laboratories where one can obtain these examinations by paying the price which expert labor deservingly commands, but public health should not be maintained at individual expense, and consequently there should exist laboratories where any problem concerning the health of families or communities can be investigated free of charge to the individual.

Some of the larger cities have established their own laboratories and the movement is to be heartily approved, but the smaller places and country districts cannot do this. What is the condition of public sanitary laboratories to-day in our commonwealth of Ohio so much boasted for its intelligence and progress?

Three cities, Cincinnati, Cleveland, Columbus, each have small laboratories. Oh, that more of our cities began with "C" or to see. Still in each of these cities the work is restricted mostly to a little bacteriological and disinfecting work because of niggardly appropriations by the city purse holders—appropriations of from two and a half to ten cents per person of the population in those cities.

The only place to-day in the great State of Ohio where a complete sanitary analysis of a water can be obtained free is in the laboratory of the State Board of Health, and yet the only substance more essential to our living than the water is the air we breathe. There is no phase of sanitary work which we would not willingly pursue in the laboratory of the State Board of Health, provided we had the funds to secure the necessary apparatus and workers. The State of Ohio contains about four million persons. The

State Board of Health because of its limited appropriation has but one worker in the laboratory to make the sanitary analyses for this vast number of persons. Yet under these conditions the Board will try to accomplish all that is possible in analytical work for you, and through you for the people. There are necessarily certain limitations, and information concerning these will be furnished the local boards by the State Board of Health.

Each year our national and state governments are spending thousands of dollars for the investigation and prevention of the diseases of cattle, sheep, swine, and the diseases affecting the cereals and small fruits. I would not decry this practice nor lessen it one iota. It is worthy of much commendation. But shall we pay less attention to the welfare of man than to the lower animals? Shall we put forth greater endeavors for the protection of our pocketbooks than for our health—our very lives? During the 12 months ending March 31, 1898, there were in the State of Ohio 3,638 deaths from tuberculosis, 1,357 from diphtheria and 1,213 from typhoid fever. Besides these 6,208 deaths consider the many cases who suffered sickness but not death from those diseases. Take the value of the work of these people lost during illness, add to it the cost of caring for them during their sickness, then place if you can a commercial value on those 6,208 lives, and considering the sum total of the cost from these three diseases—much of which could have been prevented, see if it would not be worth while to spend more money, more time and more trouble in prevention.

Dr. H. H. Wiggers, Cincinnati—I heartily endorse everything said in that paper. I am sure that he has covered the ground very well. I think every large city should have a laboratory for the purpose of making microscopical tests. These laboratories have certainly accomplished a great deal of good. We can realize it in Cincinnati. About two years ago we established a laboratory, and now we have quite a few pieces of apparatus. We examined quite a number of cases of diphtheria last month. I think we examined 80 or 90, and we have examined 25 or 30 cases for tuberculosis. The bacteriologist has charge of the milk analysis. In some months we examined 90 vessels of milk. The test we use is the Babcock centrifugal method. If we find that the fat averages 3 per cent. we are satisfied with it, but if we find that it falls below that, then we give other tests. We have not made any examination for typhoid fever, but within the next few weeks we will make all the tests. We will use the Widal tests. Just at the present time we are trying to get another room in the city hall. It is our aim and effort to bring our laboratory up to equal any laboratory in the eastern cities. I went east and visited the laboratories in New York, Philadelphia and Pittsburg. They are doing an immense work there. They have a great many men interested in the work, and they have plenty of money, all the money that is needed. They get good, earnest work in the department.

Dr. Probst—I want to say a word about the use of the State Board of Health laboratory. As has been stated by Mr. Horton, the State Board of Health in 1897 began to make an examination of the streams in Ohio to determine their purity as regards public water supplies. We had bacteriological and chemical examinations made in private laboratories. Last winter we went before the Legislature and tried to convince them that we could establish a laboratory for the State Board and do this work cheaper and in some ways better than we had been doing it. They gave us permission to establish a laboratory, but they gave us no money. They also made a condition that this river examination should go on, and that in addition we should make a report annually on all public water supplies of Ohio. We have but one man to do this work. This will explain the limits that must be put on the examinations in other directions. The State Board decided to make no examinations except those coming through the local boards of health. They would like to do all the work presented, but we must limit it. We get many samples of well water sent to us with the request to make an examination. We should be glad to make these analyses, but we cannot do it except where there is good reason to suspect that the well is polluted and has caused disease among its users. In this case we would examine that well to find out the cause of the disease. In the diagnosis of diphtheria it is not expected that every case will be referred to the State Board. I think there is danger in carrying the bacteriological diagnosis of diphtheria too far. I believe that a trained physician can usually recognize this disease without laboratory assistance, but it is in the doubtful cases that it is useful. The trouble is that often where there is some throat trouble prevailing the doctors are divided in opinion, some of them call it diphtheria and some tonsillitis. You know that doctors do sometimes disagree. The State Board will open the laboratory in these doubtful cases and send outfits for bacteriological examination. I wanted to explain, so that you may know how we are situated in this matter, and not expect too much, for the present, from the laboratory.

Dr. H. E. Welch, Health Officer, Youngstown--We have established a bacteriological laboratory in our city. Our city is small and we could not well support one, but we have a young man who is a graduate of Ann Arbor and we gave him charge of the work. We allow him the use of the apparatus for outside work. We have a complete outfit and can do good work.

Dr. W. A. Daugherty, Bucyrus—I do not believe that we should insist on the bacteriologist working as he did last year. I know that Mr. Horton, while investigating the condition of the Sandusky river, would frequently come up there at four o'clock to gain time. He has done during the last year what two men should have done. The only way to remedy this is to have the local boards to confer with the next Legislature and bring this matter before them. Show them the necessity of having more money to carry on this work. During the last Legislature I wrote to members stating that it was necessary to have an appropriation. You can confer with your county representatives and with your senators in regard to this matter, and in this way we can get a better appropriation for next year.

Isaac Redrow, Williamsburg—I would like to know if it is advisable to get a microscope to make these tests. It is not always practicable to send to the State Board of Health. I would like to know what it will cost to get a good microscope, and also whether a good physician is the best man to make the examination.

Dr. W. A. R. Tenney, Cincinnati—Mr. President, I think that paper is a very valuable one, and I move you that it be published for general circulation. I want to peruse it at my leisure.

Dr. Probst—I want to say that these proceedings will be published. There will be 10,000 copies issued and sent out. We can make a reprint of it if you so desire.

Dr. W. A. R. Tenney, Cincinnati—I think there should be additional copies of this paper published for general circulation.

Thereupon the motion was carried.

Mr. E. G. Horton, closing the discussion—I feel thankful to the gentleman from Bucyrus for wishing to give me assistance, but I do not want you to feel that I have endangered my health. I am stronger than I look. I am sorry that I have done nothing to sustain the physicians for the last 22 years except in the matter of vaccination. I am very glad indeed to know that Youngstown has a laboratory. Success to you in your work. I was in hopes the appropriation at Pittsburg would be mentioned by Dr. Wiggers. I am afraid we should be ashamed of our appropriation. They have everything nicely arranged there and $12,000 a year for salaries. In regard to the use of the microscope, I would say that you must have a man capable of using it. I do not mean that we are better than anybody else. The average physician is too busy to do this work. A good microscope will cost at least $60, and a better one than this is more desirable.

Dr. H. A. Wiggers, Cincinnati—Mr. Horton spoke of my trip to Pittsburg. It is a most wonderful laboratory. They give $12,000 a year to the men in charge of the laboratory. It is finished in oak, highly polished, and the work they do is very fine. They make their own antitoxin. They analyze the milk and the water and they do very fine work. In regard to the microscope, I want to say that it would be well enough if you had a competent man to handle it. Many doctors know nothing about the use of the microscope. To illustrate what I mean, I will state the case of a physician in Cincinnati who wanted to examine a case of diphtheria. We sent the outfit and he removed the swab and had the patient to expectorate in the tube. There was another case, of a physician who had a case of tuberculosis and he sent up to us for examination a quart Mason jar half full of sputa. We only need a drop to make the examination. You see it is quite necessary to have a man who knows how to handle the microscope.

President Kahle—You will remember that we had a motion yesterday for a committee of three on ice legislation. I will appoint on that committee, Dr. J. C. Crossland, of Zanesville, Dr. Andrew Heinlein, of Bridgeport, and Dr. L. F. Laudick, of Lima.

Dr. F. E. Kitzmiller, Health Officer, Piqua—You have a sample of a sick doctor taking his own medicine. I have been quite sick since yesterday morning. With this little apology, I hope to have your patience. In Mr. Horton's paper I noticed that in the State of Ohio last year we had 1,350 victims of diphtheria. We had quite a discussion yesterday in regard to smallpox. While this subject of mine is the last on the program, it is by no means the least. I think it is the most important thing that the different boards of health have to consider. When you see one funeral from smallpox, you will see 100 from diphtheria.

SHOULD BOARDS OF HEALTH PROVIDE ANTITOXIN FOR THE TREATMENT OF DIPHTHERIA.

By Dr. F. E. Kitzmiller, Health Officer of Piqua.

Mr. President and Gentlemen: I certainly appreciate the honor of an invitation to read a paper before this meeting of the State and Local Boards of Health, and while I feel that this honor could have been bestowed upon some one more worthy, I do not fail to recognize the compliment to myself and the city I represent.

The invitation extended to me has no doubt been brought about by the fact that the city of Piqua has had quite an experience with diphtheria during the past few years.

The subject or question given to me to discuss is of such vast importance and so broad that a volume could be written and not exhaust it.

In order to bring out the importance of the question it will be necessary for us to make quite an extensive investigation and fully consider the disease, its contagious character, management, treatment, etc., everything of importance relative to the disease must be carefully considered in order for us to be able to fully recognize the importance of the question before us.

There is no doubt but it is our duty to thoroughly investigate, so that we may see clearly what we ought to do for the health and welfare of the people.

We cannot in a few words jump to a conclusion, either one way or the other. We, as representatives of the different cities, towns and counties of the State have met together at the capital for the purpose of discussing many important questions pertaining o the health and welfare of the people. We are here to get, if possible, some new ideas and return to our people better than ever before prepared to do our duty.

I propose to talk plainly and to the point, so that every delegate can thoroughly understand me.

In the consideration of this subject I propose to give you only my personal experience and my own personal views based upon it. I will not burden you with a great amount of statistics to show what has been done in New York or Chicago, but I will prove to you what we have accomplished right at home—right in Ohio.

After some investigation I find that the State of Ohio has diphtheria twelve months in the year, and probably has more cases per thousand of population, than any other State in the Union.

For many years this disease has been very fatal, and physicians and thinking people, with few exceptions, have recognized the fact that it is very contagious. It is carried over the country in many strange ways, and it is a demonstrated fact that it is caused by a germ known as the Klebs-Löffler bacilli.

The microscope proves the presence of this germ in all cases of true diphtheria. The disease is communicated in various ways, exposure in many instances being so obscure as to baffle investigation. Some years ago there died of the disease a little girl, an only child of well-to-do parents, living in Miami county, this State. After her death the parents gathered together her books and toys and packed them in a box; later they moved to Kansas. Nearly two years after the death of the child a friend with three children came to their home upon a visit; after a few days the box of books and toys was opened and distributed among the children for their amusement. Ten days later two of these children died of diphtheria. There were no cases of the disease anywhere near, and there seems to be no doubt but this busy little germ had lived all this time.

The Klebs-Löffler bacilli, the germ of diphtheria, seems to live for a long time in books, and from experience I find that too much attention cannot be given to the disinfection of school books with formaldehyd gas wherever the disease exists among the pupils.

A year ago this winter we had scattering cases of diphtheria all through the winter and until the middle of April, when it ceased until just about time for our schools to open in September, when it appeared, and before we were hardly aware of it we had a dozen houses carded. All the summer months the school books were safely hidden away, but just prior to the beginning of the schools the children got out their school books and there was quite an amount of trading and selling of second hand books. I finally concluded that the germ of the disease came from this source, and had all the books of each school building placed into one room where we treated them to a dose of formaldehyd. From that very week there was almost an absence of new cases, and I have no doubt that the disease came directly from these books.

There is no argument necessary to convince any intelligent person of the fatal and contagious character of the disease, but great argument and frequently a few funerals are necessary to prove to some ignorant people that the disease really exists in a certain ocality. It is almost impossible to convince an ignorant man or woman that they do not know more than two or three doctors, and they can prove it by Dr. Gun.

If a case of the disease appears in such a family the strong arm of the law enforced by a health officer with plenty of backbone is all that will give the people living in the vicinity the protection required to make safe the lives of their children.

We have, in Ohio, a splendid law, that creates a board of health in every town of any size and in every township in every county of this great State. Every local board of health or its health officer has a great responsibility resting upon him. The very lives of their fellow citizens are in their hands to protect and save. In order for any health officer to do his duty in a thorough manner he must have the assistance of the physicians and the people.

There has been, in the past, a desire among some people to escape being quarantined, and I have no doubt some have succeeded, where the cases have been mild, while in other instances they have been compelled to call a physician, when the patient from neglect has been found dying.

In some instances, physicians are very careless, or worse than that, ignorant, and allow a child to become hopelessly ill before they become alarmed, and call in some other physician who quickly diagnosis a case of malignant diphtheria, and informs his careless brother that the case is undoubtedly fatal. An awful blunder has been made, not only in a life to be lost, but possibly many others to follow from the exposures during the several days that the attending physician was waiting for developments. Every physician should be able to make a quick clinical diagnosis, and in all cases of doubt take the safe side, remembering that a blunder, as described, is almost a crime. Boards of health can do nothing until they are notified of the existence of a case. Upon receiving notice of the existence of a case, then they become responsible for the protection of the people.

The important duties of the health officer we will not have time to consider at great length. He should be a physician, and, if possible, one of experience, so that he will be able to make a quick clinical diagnosis of any case he should chance to meet.

Doctors frequently report a case as suspicious, then the health officer must assume the responsibility of diagnosis. He will frequently have a rough road to travel and meet all kinds of opposition among ignorant people. He should treat all justly and exactly alike, enforcing the law in every instance, always taking the safe side and protecting the public.

Great care is necessary in the management of a case of diphtheria. The house should be carded in such a manner that the people will be able at once to recognize it as a signal of danger. No person except the attending physician should be allowed to visit the house.

The breadwinner of the family should board away from home, or else be quarantined at home. This quarantine should be strictly enforced, even if a sanitary policeman is required to guard the premises. The physician, the only person who is allowed to visit the house, should be required to use great precaution. That some are careless, there is no doubt; some are careless because they do not believe in the germ theory others, because they do not believe the disease contagious, and others are just careless on general principles. There should be a law requiring physicians to use the greatest care and take every precaution before coming into contact with the general public. There is no reason why a physician cannot stand at the side of the patient while making an examination, thus protecting his clothing, keep from coming in contact with the bed clothing, etc.; avoid sitting down or coming in contact with anything except his hands, and as soon as he leaves the sick room, thoroughly wash his hands with a germ-killing solution.

There is no excuse for a careless doctor. They are the very people who ought to be an example to the general public, who are supposed to know little about necessary precautions.

The patient should be completely isolated from all the family except the nurse, not forgetting that adults are liable to contract the disease, and so remain, until convalescence is assured, by waiting what seems a proper length of time after the membranes disappear, or better still, taking a culture.

When the time arrives to raise the quarantine, then great care should be taken so that the disinfection be thorough and complete. Every article, especially wearing apparel, of both patient and nurse, should be left in the room, the patient and nurse should both be given a thorough bath, as advised by the pamphlet issued by the State Board of Health, and then this room with all its contents should be taken in charge by the health officer or his assistant, and be thoroughly fumigated with the greatest of all germ-killers—formaldehyd gas.

The only way to be sure of proper fumigation is for the health department to do the work. The work will not be half done if trusted to the people. From our experience in the use of the gas, we believe it to be much better than sulphur fumes, being much more pleasant and not injurious to any fabric or metal.

We have now considered, at some length, measures to prevent the spread of the disease by quarantine, etc., but there is another thing of vast importance, not only to the patient, but to others of the family and in fact to the whole community, that is the proper and active treatment of the case, cutting short the disease, and greatly reducing the danger of exposure to others. This is the best for the patient because it changes a malignant case into a mild case, and saves the life of every case in which it is used at the proper time. All this can be accomplished by the use of that great and noble remedy, diphtheria antitoxin.

The quick and certain effect of this remedy is positive proof to my mind that diphtheria always starts as a local disease. If a patient is given the remedy early it thoroughly protects the system against the absorption of the toxin or poison that is secreted by the germ, and we have convalescence almost at once. I have myself treated about one hundred and fifty cases with this remedy without a single failure, except in a few cases where I was called in after absorption of the toxin had taken place.

When we first began the use of antitoxin in our city, three years ago, I remember how I was criticised by some physicians. They told the people how I was constantly loaded down with horse juice, ready to squirt it into every unsuspecting patient whether they had diphtheria or not, they also pictured out great abscesses, and if that was not sufficient to frighten the people, they then proceeded to show that heart failure would clean up what was left of the patient. Very many people were turned against the remedy in this way, but the right will prevail, and I am glad I have lived to see nearly every one of these physicians inject the same serum and applaud its wonderful curative properties.

My experience is that, as fast as physicians investigate and use the remedy they are without exception convinced of its real worth, and become warm advocates of its general use.

If you find an enemy to antitoxin, just find out what he knows about it. It won't take much time, and you will likely find that he has read some articles from cross-road doctors with no experience, such as I have seen in the St. Louis *Medical Brief* or he is opposed to it because it has failed to cure some neglected case, "perhaps his own," that was moribund when the injection was made.

The injection of antitoxin in a case that is moribund dying from the absorption of the toxin, is certainly an injustice to the remedy. After the system is thoroughly poisoned, I do not believe antitoxin can do any good, but where we charge the system with antitoxin before the absorption of the toxin takes place, at least to any great extent, then we can always expect speedy convalescence, and my faith is so great that I never expect to lose another patient if I have the case at the proper time, along with a reliable serum to inject.

The highest medical authorities recognize that diphtheria toxin, the poison secreted by the germ, is rapidly absorbed and very fatal, and urge the absolute necessity of administering antitoxin, the antitode, as early as possible, thereby preventing profound constitutional disturbances to the nervous system.

All reports show, and my own personal experience proves that, where antitoxin is injected during the first or second day, that the death rate is cut down to almost nothing, and that only neglected cases die.

The injection of antitoxin is as harmless as water, and no possible harm can follow its free administration.

Many persons have objected to the use of antitoxin, simply because it is taken from a horse.

The horse, the proud, healthy, vigorous animal that he is, see him where you will, water must be pure or he will snort his refusal to drink, and the same rule he carries out strictly in the selection of his food, yet these same people who object to antitoxin will see a hog dive down into all sorts of filth, eating dead rats or any other refuse, and they will the next day be served with a dinner largely composed of this same porker, possibly in the shape of sausage encased in the intestines from which the refuse eaten the day before has been removed.

I know of few things we eat or drink that are pure enough for subcutaneous injection. Antitoxin, as it comes from the laboratory, is certainly pure and loaded down with life-saving properties besides.

I presume these people imagine that they almost see an old plug horse being bled for the serum. I cannot find any other animal as clean and healthy as the horse, and if we visit the stables where antitoxin is produced, we there find probably one hundred and fifty of the finest young and healthy horses we ever saw. These horses are by tests proven to be free from disease. They are fed upon the purest of food, kept absolutely clean, and given sufficient exercise for health. They are constantly attended by an experienced veterinary surgeon, and made immune to a very high degree by the injection of the toxin taken from the germ of diphtheria. All this is done by experts. After the horse is proven to be sufficiently immune, and with every antiseptic precaution, his blood is drawn off, and the serum taken from it, which, after proper antiseptic precaution, is put up for the market. I cannot imagine anything purer than this product, nor can I imagine anything more noble than the horse, the great friend and helper of mankind, who now sheds his own blood to save human life.

To the physician who in years gone by was compelled to witness the many sad deaths then sure to follow the disease—diphtheria—antitoxin seems like something from heaven sent to save the lives of little children. What a blessing! What a relief to the weeping mother, the solid comfort and consolation the physician of the hour can almost guarantee by the use of this life-saving serum.

Instead of the patient being seriously sick from 10 days to two or three weeks, and perhaps for days lying at the very point of death, then either slowly convalescing or quietly given over to the undertaker, by the use of this remedy we have prompt convalescence and recovery without serious loss of vitality. In fact antitoxin acts as a preventative, preventing the absorption of the toxin and the whole system becomes charged with it to such an extent that every secretion is a germicide. By microscopic examination we find that the germs very soon disappear after the introduction of the serum.

Now, please allow me to call your attention to the history of two epidemics. Five years ago we had in the city of Piqua an epidemic, and during four months had 100 cases of diphtheria, with 25 deaths and 75 recoveries.

Our health department was active, and I know that our physicians were thoroughly up to the times and faithful in their attention upon the sick.

I very well remember that we were congratulated by both Drs. Probst and Hoover, of the State Board of Health, for our low death rate, and knowing the death rate at that time to be anywhere from 25 to 50 per cent., I remember that we felt quite proud of our success.

During the past fall and winter we have experienced another epidemic, having had a total of 65 cases, with three deaths and 62 recoveries. The three deaths were under the following circumstances:

First death—Boy, age six years; in dying condition before attending physician recognized the disease.

Second death—Boy, age seven years; sick five days before a physician was called found in dying condition upon his arrival.

Third death—Boy, age four years; undoubtedly sick some time before physician was called.

You have before you the history of two epidemics. First, 100 cases and 25 deaths. Second, 65 cases with three deaths, two of which were from carelessness without the shade of a doubt.

Why this great saving of life in the same disease, the same city, the same physicians? Five years ago we were proud of a death rate of 25 per cent., now reducing it to almost nothing.

I might go on and give you more figures, but that is unnecessary, those given fully prove the life-saving properties of that greatest of all remedies—antitoxin.

There is no doubt but we have a remedy that is a specific, if intelligently used and provided a reliable preparation of serum is injected.

Some time ago I was called into a family consisting of father, mother and six children, aged from baby of 12 months to oldest boy aged 10 years. This family lived in a very small house, and I found the oldest boy sick with diphtheria. I injected antitoxin, and although it was a well-defined case, the throat was clear, and he was convalescent in 48 hours, at which time I found his brother aged eight years, had contracted the disease. His case seemed mild and I put him upon the usual line of treatment without antitoxin. This boy grew worse and worse and the membranes remained upon his tonsils until the eighteenth day. His system absorbed the poison toxin of the germ to such an extent that for days he was threatened with death from heart failure, but by the aid of stimulants, etc., he weathered the storm and made a slow recovery, being confined to his bed one month. The other four children, including the baby twelve months old, all contracted the disease, and in all of these cases

I promptly used the antitoxin, and they all promptly recovered. So prompt were their recoveries that none of them were in bed over two or three days. I took several physicians to see these cases and they all came away firm believers in antitoxin.

I can see now what a mistake it was not to use the antitoxin in the second case that was sick so long, but I made a greater mistake than that. I see now what I ought to have done and saved time and money, and likely outside exposure of other persons. I should have immunized all the children immediately upon the discovery of the first case by the injection of two hundred and fifty units of antitoxin, then in a little over two weeks the quarantine could have been safely raised, as it was the family was quarantined six weeks.

There is no question but fifteen hundred units of antitoxin used at once would have accomplished more than did five times as much later on. I do not believe the time far distant when immunizing with diphtheria antitoxin will be considered as important for children exposed to the disease vaccination is important for persons exposed to smallpox.

Almost every county in our State now boasts of a well-kept Children's Home, and there is no question that it would be economy and right and justice to immunize every child upon the first appearance of diphtheria.

An immunizing dose of antitoxin, two hundred and fifty to three hundred units, will certainly give protection of thirty to sixty days, which gives ample time for the recovery of the sick and the thorough disinfection of the building.

In the use of antitoxin in diphtheria I have frequently noticed what health officials generally find out later, that the quick and perfect cure of the patient causes many people to come to the conclusion that they have been fooled or deceived by their physician, and that the patient instead of having had diphtheria, only had a bad cold. They may not say much, but they are very likely to become careless and instead of keeping the patient isolated they allow it to associate with their other children, and the next thing you hear is the report of another case or two. This has been frequently done in our city and among some people where you would not expect it.

In the use of diphtheritic antitoxin it is certainly a matter of great importance to select a serum that is pure and that contains the full number of antitoxic units it is represented to contain. If we have in hand a case of diphtheria and want to inject one thousand units, we want a serum that contains every unit marked upon the package.

I have recently seen published statements of tests made of diphtheritic antitoxin purchased in the open market, some of which have proven to be very far below the number of units marked upon the package. This is a matter of great importance to physicians and health officials. It should be investigated thoroughly and they should remember that the best is none too good for the little sufferers whose lives depend upon it.

Each unit of antitoxin must be ten times the amount of antitoxic serum required to protect a guinea pig against ten times the least fatal dose of diphtheria toxin.

Health officials and physicians should demand convincing evidence that each unit of antitoxin will neutralize one hundred fatal doses of diphtheria toxin in the guinea pig, and that each package of serum contains the full number of units claimed.

I am not here to-day to say one word against any honest producer of the serum. I am the friend of any man or firm who puts up a good reliable article only. I prefer him to be an American, and I am sorry that an American granted to a foreigner a patent upon the production of this serum, which he could not get in his own country and trust that in the near future it may be revoked.

I am not here as the agent of any producer of the serum, but I am here to be honest and fair, and I cannot fail to publicly recognize the great life-saving qualities of the serum used in our city from the laboratories of H. K. Mulford & Co., of Philadelphia, and Parke, Davis & Co., of Detroit, Michigan.

Both of these serums have been extensively used, and I have myself used them side by side in the same families, and I believe them both to be pure, and that they will, either of them, save the life of every patient in which they are injected, if used at the proper time. Some others may produce a serum just as good, but these two products have been used in our city in probably five hundred cases without a bad result. They have saved so many lives that we will certainly continue their use as long as they give us such satisfactory results.

It is probably about time to come to the point of answering the question: Should boards of health provide antitoxin for the treatment of diphtheria? I answer in the affirmative. We have in a few words discussed the disease, its restrictions and its cure. The evidence presented is convincing under the best known treatment before the discovery of diphtheritic antitoxin. We had a death rate of anywhere from 25 to 50 per cent. At the present time, among physicians who understand their business and properly use the remedy, we have a death rate of almost nothing.

There is absolutely no argument except upon the side of the serum. There is no doubt of the fact that boards of health, under the existing laws, have a legal right to adopt any measure that in their judgment will best protect the people.

The people demand and deserve the best attention, and who can say no to a question of this kind. Boards of health are organized by the people, for the people, rich and poor alike.

We have before us home evidence, so convincing in character, that every board of health in Ohio can see their duty plainly written between the lines. The use of antitoxin has long since ceased to be an experiment, it has stood the test and saved *thousands* of lives at home and abroad.

Should boards of health provide antitoxin for the treatment of diphtheria?

They certainly should. New York, Philadelphia, Boston, Washington, Pittsburgh Chicago, and many other cities furnish it with a free hand. They furnish it because hey know it saves life.

They know that by its quick cures it reduces the amount of exposure. They use it freely to immunize children that have been exposed.

The poorest child in Ohio should not be so neglected by Ohio's officials as to fail to receive promptly and freely this greatest of all remedies.

There is no doubt in my mind that every board of health in the State should arrange so that the outdoor poor and all persons in infirmaries, homes for children, etc., shall be promptly treated or immunized, as advised by the physician, at the expense of the people.

Now, gentlemen, I have presented to you the very strongest evidence secured right at home. I have briefly and truthfully given you the result of our experience in the management and treatment of this "until recently" most fatal disease.

The State Board of Health records will prove that all my figures are correct, and if what I have said to you results in the saving of one little child's life, then I am paid for my time and labor.

I have spoken to you in earnest tones, because I am pleading to save life. Let us return to our homes more than ever determined to do our duty, and we, I am sure, wi be the means of saving many lives.

H. J. Clark, Oberlin—I want to ask a question in regard to this antitoxin. How long will it retain its properties, or how fresh must it be to be good?

Dr. Kitzmiller—I want to say that I have only had experience with two preparations, that of Parke, Davis, of Detroit, and Mulford, of Philadelphia. I say in my paper that they both are good. These firms guarantee their preparations for three months, and at the end of that time they will exchange it for fresh antitoxin. I think it is good for three months.

Dr. J. F. Marchand, Canton—Perhaps the most unfortunate feature of our meeting at this time of the year, is that such an important paper comes at the last part of the session. I am here to endorse every word that Dr. Kitzmiller has said. I wish every physician in Ohio could read that paper. I wish that every board in the State could have that paper in their hands. I think that in the closing days of the Nineteenth century the coming work of the medical profession is vaccination and antitoxin. If nothing else had been saved to medicine for a 100 years, I think that antitoxin would be a crown to that profession. I am sure I know whereof I speak. When it comes to your family as it did to mine you will then know the value of this great preparation. We are here to favor scientific, rational medicine. Gentlemen who represent the State and municipal boards can go out in their communities and keep the death angel from the door. There is nothing more plain to me than the path of duty in this regard. It is our duty to purchase this antitoxin for these little children. We can put a stop to this membranous croup which comes in the form of a nightmare to the mothers of this land. Physicians have not felt safe in this matter. When we review the statistics we find from the statement of Dr. Benner that if antitoxin had been used in the United States, it would have prevented the 150,000 graves of little children who have fallen victims to this dread disease. Who can deny to them the benefit of such a remedy. The man who believes least in it, is the man who has used it least. By its use we have reversed the tables, so that instead of having 80 per cent. of mortality, we have 80 per cent. of recovery. If we could come back here in 50 years, we could effect some such remedy for other diseases. I would like to come back to the Capital City of Ohio in 50 years and see what has been done. We are nearing the end of this century, and we should not undo what we have done. I wish every physician who has scruples against antitoxin would not rise against it until he knows something of the other side. I have treated 20 patients this fall with success. In regard to the amount of antitoxin, we should give doses according to the symptoms, and watch the case just as we watch the administration of drugs. I think that membranous croup is not generally believed to be diphtheria. I am not here to discuss it, but when we deny that membranous croup is diphtheria, we expose the community to it. Truly, morbific changes will manifest themselves in various ways. We can argue against the use of antitoxin because it is a mild case, but if it is diphtheria, it is diphtheria, and should have antitoxin just as much as if it were a malignant case.

Dr. H. H. Wiggers, Cincinnati—I want to endorse the doctor. Our health department furnishes free antitoxin to people who are not able to pay. The certificate of the attending physician enables them to get the antitoxin. I believe in thorough disinfection after the patient recovers or dies. The custom has been in Cincinnati that when the doctor discharges the patient, in seven days we make a culture, the doctor being supposed to swab out the throat. We examine it the next day, or within 12 hours. If we find that the case does not show any more bacilli, we wait seven days and then we disinfect the house with formaldehyd gas. A few days ago we made a change. Our doctors did not want to make the last call. They now make it on their call next to the last. We wait seven days and make a culture. Then we make another culture in seven days, making 14 days. We keep on making cultures every week until the throat is clear and free from bacilli. In one case the doctor got quite angry and said it was no diphtheria at all. I wanted to make another culture, and the doctor said it was of no use. This doctor, in a few days, reported two cases of diphtheria in the same family. It was after the fourteenth day, and shows that there is danger.

Dr. Kitzmiller—Was the house fumigated?

Dr. Wiggers—No; we do not fumigate the house until after the throat is clear. The doctor states that where the infection is great, it will do no good. Of course in a moribund case, it will do no good. A doctor called me across the river to a case in Newport. Seven days after he called me up and said he had no diphtheria, but diphtheritic croup. I took 3,000 units of antitoxin and went over. I said to him it is rather late to use it, as the child had been sick for nine days. We used it and the following morning I gave it 1,000 units more. The child recovered. This shows that it will sometimes do good when given late in the disease. If you can use it right away the mortality is nothing.

E. G. Horton—Whether we believe a thing or not, if it accomplishes the results, we must accept it. If lives are saved by it we should use it.

I noticed that there were some expressions of credulity here, when it was stated that it would cure diphtheria. I think the statistics will show that it has done good. There is one point and that is in regard to its strength. Some of it may be good and some of it may not be. I think there should be an examination of the antitoxin. Then you would know whether it contained the units that is claimed for it.

Dr. Marchand—I want to say that the Canton Board of Health furnishes it to all poor cases. We believe such a course is useful in stamping out disease. So many poor people who are under the care of the city physician, cannot care for themselves properly. We think that if the board of health pursues such a policy, it will tend to limit the spread of diphtheria and membranous croup.

Dr. Shaw, Sidney—Last spring our board met with the township board and agreed to furnish them all with antitoxin. We had 15 cases, and they were well in about three days.

Dr. Sinnett, Granville—I want to say that I am interested in the subject of antitoxin. It is all right in the city practice, but it is a question in regard to the country. It seems to me there might be some way to establish a connection with the boards of health in the country, for the purchase and use of antitoxin. If it can be demonstrated by intelligent analysis that it is good, it seems to me that there should be some way to put it in the country districts.

Dr. Reed—Mr. President, I want to ask whether there is a monopoly in the manufacture and sale of antitoxin ?

Dr. Kahle—I do not know of any monopoly in this matter.

Dr. Laudick, Lima—I want to say that when I first started out to practice medicine, I was called in to see five cases of diphtheria and three of them died. I began to think that I would much rather farm than to practice medicine. Since I began to use antitoxin I do not have much fear if I get the case in time. In the last epidemic at our place I had 26 cases and I had only one death. You can see from this statement that my first and last experiences are very different. In one case of membranous or diphtheritic croup, I administered 5,000 units of antitoxin, and in 36 hours I gave it 2,000 units more. I thought I had given enough to kill the child, but it recovered. There was a consultation of four different physicians on the case. In using the antitoxin it is a well-known fact that it must be used in the beginning of the case. In regard to the contagion following this, I want to report a case that occurred outside of the corporation 1½ miles. I was called in consultation in the case. The child died 24 hours afterward. Twelve days after this the family was cleaned up and the home was fumigated, everything was all right and the boy went on a visit to a neighbor. Eight days after that child had slept with the neighbor's boy, there was a case of diphtheria. So you see, that in this case after everything was supposed to be all right, and and on the 12th day afterward, this child sleeping with the other child, communicated the disease to him.

Dr. W. A. R. Tenney, Cincinnati—Mr. President, in order to get the expression of this convention on the matter, I move you that it is the sense of this convention that it is the duty of boards of health to provide antitoxin for the use in all cases where people are not able to procure it.

Carried.

Dr. Kitzmiller—Gentlemen, I am very much pleased with the reception of my paper and with the complimentary remarks that I have heard. I can say no more in regard to it than to emphasize everything in it. I am not a crank in medicine, but I am a firm believer in the use of antitoxin. I know it will save the life of every child if it is used in time. In diphtheria the germ first lodges in the throat. It finds good soil there and multiplies. It takes some little time before the poison produced by these germs gets into the system. If you inject the antitoxin before that poison gets into the system, it will do good work and the family will thank you for it, but they will probably think that you did not have a case of diphtheria. There are some people in this world who criticise things without an investigation. Many men find fault with everything, just on the same principle the political parties find fault with each other. I feel sorry to have any one to oppose the use of antitoxin. I remember a case of a man who had fought antitoxin most bitterly. I cured a case of diphtheria for him in 48 hours, and he acknowledged its value. Now in regard to the subject of quarantine, I want to say that I have had some experience along this line. Dr. Probst can tell you that we have a different people from some of you in other parts of the State. Where we find disease among the ignorant people, we find that it is only the fear of the law that makes them obey the law. In all such cases we take no chances, but we put a guard at the door and we put a policeman on duty to see that they stay in and observe the law.

Question—How shall township boards of health provide for expenses which may arise from their administration?

John A. Harned, Clerk Xenia Township Board of Health—Mr. President, I have attended, I believe, every meeting of the State association since its organization except the meeting last year. Every time that I come here that same question is asked. Our good secretary has only replied, pay it out of the township funds. I have figured it out and give you the results of my search:

A citizen engaged in sprinkling his sidewalk, while a neighboring small boy was industriously sweeping his, raising at the same time a blindding cloud of dust, testily inquired, "Why don't you get a thingumbob and whatcher-may-call-it your sidewalk?" "'Cause I ain't got no whta's-his-name to get none," promptly replied the small boy.

This is the predicament of the township board of health. Vested with authority to contract expense, but without means provided to pay same. While the city or village board may apply to their respective councils to pay debts contracted, the township board has no such recourse.

The levy for general township purposes, varying from one mill on a a valuation of $200,000 or less to one-fourth of a mill on a valuation of $800,000 or more, is sufficient only for purposes heretofore authorized. While ordinary expenses might be met from it, yet cases will occur which will create a debt which they are unable to meet.

This can be illustrated by my own township of Xenia. We have a population of 6,000 or more outside of city limits coming under the care of the township board of health. This limit also contains the slaughter houses and dumping ground of a city of 10,000, with no system of sewerage. Also the Ohio Soldiers' and Sailors' Orphans' Home, with a population of 1,000 or more, who have their own methods of disposing of their sewage. When in obedience to instructions from the State Board, our township board was organized, this situation confronted us. We entered a *terra incognita* without experience; we now have it to dispose of in lots to suit purchasers.

The expenses of our first year were $52.80, which were readily met from the general township fund. The second year's expenses, however, were not met so satisfactorily. After a case or two of diphtheria, scarlet fever struck us, and two months' experience, with 13 cases and three deaths, left us with a debt of $821.68. This for physicians' fees, nurses, medicines, supplies, property destroyed and replaced. We carried this debt two years, and then refunded it in a bond.

This could be done at that time, but what is the present status? The last session of the General Assembly enacted a law prohibiting the entering into any contract, agreement or obligation involving the expenditure of money, or passing resolution appropriating money, until the clerk shall first certify that the money to pay same is in the hands of the treasurer to the credit of the fund upon which the order is drawn, or has been levied and placed on the duplicate and is in process of collection. (See Senate bill No. 315, Ohio Laws 1896, Vol. 92 page 341.) While the township board may be ready and willing to carry out the provisions of the sanitary law, virtually their hands are tied. The board of health in the township is a valuable adjunct to that of the city. Secretary Probst will recall the fact that two years ago I notified him that diphtheria had appeared in a house near the O. S. & S. O. Home, where there are 900 children. The disease was met and stamped out after two cases had occurred in a family of nine. Some years prior to this time diphtheria was introduced into the Home, and more than 30 little children and a brave girl, who had volunteered as a nurse, fell victims to the dread disease. Who will say that a similar condition might not have prevailed but for the prompt action of the township board? A life saved is of far more value than expense incurred.

The remedy for the state of existing affairs is simple; a tax specific as to its levy for sanitary purposes should be enacted.

This need not be excessive; a tax of $\frac{1}{8}$ to $\frac{3}{8}$ mills levied in proportion to valuation would be sufficient in a majority of townships, which in proportion to the benefit derived therefrom would be nominal.

The proper place from which such a law should emanate would be the State Board of Health. They are conversant with the facts in the case, and in a position to learn the needs of the various township boards.

Question—How can we control suspected cases of tuberculosis in milk cows where the milk is sold to the public?

Dr. Stanton—We have a right to prevent the sale of milk if we believe the cow has tuberculosis. You can have the cow tested if you suspect a case of tuberculosis. I think you not only have the power to do this, but it is your duty to do it. If you find the cow is suffering from tuberculosis, then proceed to stop the sale of the milk.

Dr. Ross, Granville—We had a dairy within four miles of our town. A veterinary surgeon came out there and condemned two of their milk cows. Our township board claimed that they had no authority to kill the cattle. I should like to hear from this convention on that point.

Dr. Stanton—I think that the better plan would be that the sale of milk should be placed under the control of the board of health. Milk should be sold with the permission of the board. That should be the rule in every town whether large or small. If this plan were adopted and you had a suspected case in a dairy you could revoke the permit. If they continued you could have them arrested for selling without a license. I know this was done in Cincinnati, where there was suspicion that milk was being sold from unhealthy cows. It was done also in cases where the dairies were not kept clean. Prosecutions have been successfully carried into the courts, after the licenses have been revoked.

Dr. Sinnet, Granville—I want to ask whether a cow suffering from this disease could keep herself in good condition? I want to give you an illustration in regard to this point. A steer was killed in our town, and when it came to dressing him they found little lung tissues. The animal looked well and was supposed to be all right. I said to them they could not sell this meat, but it has always been a mystery to me why this animal kept up in such good condition and presented so good an appearance.

Dr. Stanton—You cannot always tell by the appearance of an animal. You cannot always tell by the appearance of a person or animal whether they are suffering from tuberculosis.

Question—In scarlet fever of mild form, how long should quarantine be maintained? Is it possible for desquamation to be complete within two weeks after the patient is taken sick with scarlet fever?

Wm. Ackerman, Fredericktown—The reason I asked the question is this: We had a case of scarlet fever in our town. The patient had been sick for three weeks. The doctor reported desquamation complete. The health officer refused to remove the quarantine. The health officer reported that the child had begun desquamation again.

Dr. Stanton—It seems to me that people affected with the mild cases are just as dangerous as the severe cases. Children with mild cases go about, and there is more danger to the public from a mild case than there is from a severe case. Varioloid is more to be feared than a typical case of smallpox, for the same reason. Mild cases make people careless. The quarantine should be maintained just as long in a mild case of scarlet fever as in a severe case. It should be maintained until desquamation ceases. It is not a question of the mildness of the disease, but it is a question of how long the desquamation may continue. It may continue for a month. It should be quarantined until danger is absolutely passed.

Wm. Ackerman, Fredericktown—Should it be continued for 12 days after the desquamation?

Dr. Sinnet, Granville—I have had some experience in this matter. I think protection should be extended in mild cases of scarlet fever just the same as it is extended in varioloid. I think you cannot impress this fact too strong upon your people. Some people think that a mild form of disease is not dangerous.

Dr. W. A. Daugherty, Bucyrus—A physician will often dismiss a case before scaling has ceased. We find that as long as there is scaling in scarlet fever, there is danger. We never raise the quarantine until all the scales are off.

Question—Should not township boards of health be compelled to send delegates to attend the annual meetings of the State Board?

President Kahle—There is no law to compel them to send delegates to this meeting, but I am sure it would be to their best interests to do so.

Question—Is it the duty of a local board of health to send a physician or health officer before removing quarantine, if they doubt that the attending physician, furnishing certificate, has visited the case after desquamation began? We refer in this question especially to scarlet fever.

President Kahle—The board of health has the power to send a physician to examine the case if they have any doubts, or if they desire any information in regard to the diagnosis of the case or the sincerity of the physician. It is exclusively with the board of health to raise the quarantine.

Question—Is it the township doctor's place to treat any case of smallpox as sanitary officer of the township, or is it the duty of the board to hire some other physician?

Dr. Laudick, Lima—I would say that it depends on whether the doctor wants to treat it or not. If he does not want to treat the case, you cannot compel him to do so. Most of the boards have regulations in regard to this matter. With us if a man does not wish to treat the case, he so states and the board employs some one else. There have been many different plans tried by the different boards. I cannot answer the question satisfactorily. Of course if they cannot pay it the county pays it.

Dr. D. D. Laws, Barnesville—In our county the physicians are hired by the county infirmary directors, and they are compelled to treat these cases. They are furnished assistance if necessary.

Dr. ———, Germantown—As president of a local board of health, I want to say that we take the lowest bidder to treat these cases. Such people as can, pay for their treatment, and for those people who are not able to pay for it, the township pays it.

Question—Will rules and regulations, regularly adopted and published by former township boards, hold good notwithstanding the board is reorganized every year as required by law.

President Kahle—As I understand it, their laws or rules are good until they are repealed.

Question—Give the correct method of proceeding when quarantine has been violated, whether by civil or criminal action, and who is the proper person to commence this action?

C. F. Eise, Galion—I would say in regard to that question that we had an experience of this kind with a physician, and the board of health instructed the health officer to commence the proceedings. I think the health officer is the proper one to bring an action where the law has been violated.

L. T. Sheets, Tippecanoe City—Could not that action be commenced by anyone filing the proper affidavit in the case? It seems to me that all prosecutions brought under the rules and regulations of the board of health for violations, would be criminal prosecutions. I should think the only thing necessary is to file an affidavit, and on this affidavit the warrant would be issued. I think anybody filing an affidavit could bring the action. The question that always bothered me as mayor of our town was this: whether the board of health would not be violating the quarantine in case the man was convicted and sent to the workhouse where others would be exposed to smallpox from him. What would you do with that matter?

Dr. L. F. Laudick, Lima—I would dispose of him by quarantining him with a gatling gun and then give him the medicine afterward. Mr. Fisk spoke of our case of a physician who neglected to report a case of membranous croup. The first thing I knew the child was dead. I filed the affidavit myself and the doctor paid the fine. We have not had any trouble since. If you make a few examples of this kind you will have no trouble.

L. T. Sheets, question—Is there any law by which you can quarantine a man before you fine him?

Dr. Laudick, Lima—Your first duty is to quarantine him absolutely until he is safe, and then after that you can give him the fine. The first duty of the health officer is to see that he is thoroughly quarantined. After this you can attend to his case according to the law.

Question—Give cause why the present death rate from tuberculosis is so high in this State?

Dr. W. A. Daugherty, Bucyrus—In regard to this question, I do not know that the death rate has increased in our State. I think it would be a good thing if we were to pass a resolution asking the State Board of Health to compel physicians to report all cases of tuberculosis and to obtain sputa and have it examined.

Question—If clothing and bedding are to be destroyed after smallpox, what is the best means of doing it?

President Kahle—The best way is to burn it.

Question—Give us a set of rules that we can keep a perfect record of all diseases, deaths and births during the year.

(No answer.)

Dr. Daugherty—I think we should let our railroads know how we feel about their railroad certificates. They know we had about 350 delegates last year. They came up at this time to sign their certificates and spoil the last part of our session.

Dr. Stanton—I do not think the railroads should be censured. The regulations covering our transportation are the same every year. The Secretary of the State Board, in sending out the announcement of this convention, called the attention of the delegates to this matter. The railroads have certain rules and regulations and you must comply with them.

Dr. Daugherty—Mr. President: There was a committee appointed last year in regard to county organization and it was to report this year. I should like to have them report.

President Kahle—I believe the committee is absent, or at least not ready to report.

Gentlemen: The hour for closing our convention has arrived, and before we close the session, I desire to take this opportunity to thank the delegates for their attendance at this meeting. It shows your interest in the success of our work. I also desire to thank you for the interest you have taken in the sessions of the convention, and for the uniform courtesy with which I have been treated as your presiding officer. I trust the sessions of this convention have been pleasant and profitable to all of us. We are now ready to adjourn.

On motion the meeting adjourned.

ERRATA.

Page 350, line 4, read *corrections* for *connections.*

Page 409, line 5, read *turbidity* for *urbidity.*

Page 412, line 35, read *rumors* for *rumor.*

Page 414, 4th line from bottom, comma for period.

Page 414, last line but 1, read *as* for *a.*

Page 415, line 1, read *surface* for *face.*

Page 419, last line, read 8.384 for 8384.

Page 426, 4th line from bottom, insert "*of November*" after "*month.*"

Page 442, 16th line from bottom, *River & Gallery* read *River, Well, and Gallery.*

Page 463, 21st line from bottom, *drained* read *dammed.*

Page 472, 12th line from bottom, *is* read *are.*

Page 478, 6th line from bottom, *fu* read *full.*

Page 480, 10th line from top, 35 read .035.

Page 488, 11th line from bottom, *is six* read *is lowered six.*

Page 499, 3d line from top, *supplies* read *supplied.*

Page 499, 5th line from top, *supplied* read *supplies.*

Page 501, 7th line from bottom, *and* read *as.*

Page 504, Title 1, *Subsurface* read 1, *Surface.*

Page 508, 6th line from top, .87 read .107

Page 508, 7th line from top, .87 read .087.

Page 510, 14th line from top, *has* read *have.*

Page 514, 3d line from bottom, 209 read 20.9.

Page 523, 10th line from bottom, 45 read 4.5.

Page 525, 4th line from bottom, *one of the* read *the one.*

Page 527, 13th line from top, *water yet, well* read *water, yet well.*

Page 545, 14th line from top, 646 read 64.6.

Page 549, 18th line from top, 4383 read 438.3.

Page 553, 10th line from bottom, 84 read 8.4.

Page 570, 7th line from top, *leakings* read *leachings.*

Page 583, 8th line from top, *one* read *both.*

Page 583, 16th line from bottom, *per day for the first* 1,000 read *for the first* 1,000 *gallons per day.*

Page 583, 15th line from bottom, 10 *per day* read 1,000 *per day.*

Page 588, 5 lines, beginning line 17 from bottom, should read: *There are* 11½ *miles of mains to which some* 80 *per cent. of the city's population have access. The average daily consumption per consumer is* 220 *gallons. This means but little, as the city water is but little used for domestic purposes. There are* 485 *services, of which* 367 *are in use and* 128 *of these metered.*

Page 591, 2d line from bottom, *will be* read *will soon be.*

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